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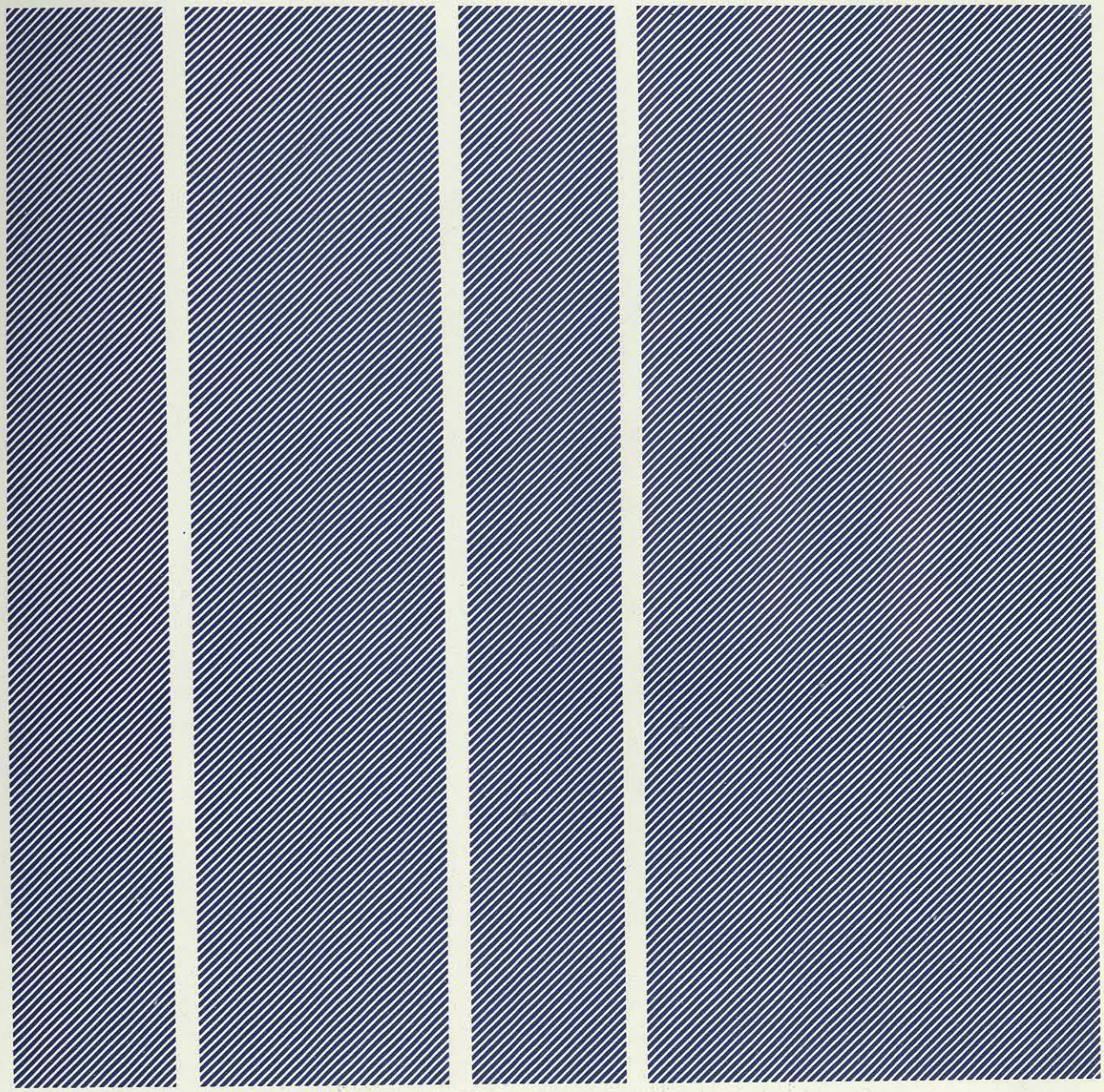
Managing the Human Aspects of Change

May 1984



The Butler Cox Foundation

THE BUTLER COX FOUNDATION

REPORT SERIES NO. 41

MANAGING THE HUMAN ASPECTS OF CHANGE

ISSUED MAY 1984

Abstract

In addition to technology, computer specialists need to take account of human factors in order to ease the change brought about by introducing new information systems. The reason is that today more end users are affected more continually than in the past. And because the business implications of new computer systems are often more far-reaching, the consequences of change are harder to predict in terms of job nature and content.

The message of this report is that the management of change is in essence the management of participation. People respond best to change if given the opportunity to participate in planning the change.

Gaining the constructive involvement of end users is not an easy task, but it is a vitally important one. This report first describes the theoretical background. It then summarises the conventional approach to system design, and looks at a step beyond: the participative approach, in which end users take part in the design process. Finally, the report sets out practical guidelines for anticipating and minimising the human aspects of change arising from information technology.

Research team

The report was researched and written by:

Chris Woodward, a consultant with Butler Cox specialising in information systems and the management of computing projects. He has extensive experience of systems development and maintenance and has carried out numerous projects involving both large mainframe computers and smaller distributed systems.

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THE BUTLER COX FOUNDATION

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The Foundation not only provides access to an extensive and coherent programme of continuous research, it also provides an opportunity for widespread exchange of experience and views between its members.

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The research programme is planned jointly by Butler Cox and by the member organisations. Half of the research topics are selected by Butler Cox and half by preferences expressed by the membership. Each year a short list of topics is circulated for consideration by the members. Member organisations rank the topics according to their own requirements and as a result of this process, members' preferences are determined.

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THE BUTLER COX FOUNDATION

REPORT SERIES NO. 41

MANAGING THE HUMAN ASPECTS OF CHANGE

CONTENTS

MANAGING THE HUMAN ASPECTS OF CHANGE

REPORT SYNOPSIS

Senior managers today are well aware that technology is advancing at an astonishing rate, and that information technology in particular is the force that is driving most new developments in business. Computer systems have passed the stage where they simply do existing things better; they have now made possible completely new functions and ways of achieving objectives.

In this situation, which implies continual change within organisations, attention tends to be focused on the technology. Only by understanding what the technology can offer can the new methods be designed. But one element of the technology change that is happening is an emphasis on closer contact with the computer systems by more people, including many who would not regard themselves as data processing practitioners.

To focus on the technology is therefore not enough. Human factors also have to be taken into account. And this means more than simply telling people what is going on: they will respond best to change if they are given the opportunity to participate in planning that change. The message of this report is that the management of change is in essence the management of participation. It is not an easy task, but it is a vitally important one.

Experience shows that many of the consequences of change cannot be predicted. And, indeed, though the need for change may be accepted, organisations may be restricted in their ability to initiate or respond to change because of the rigidity of their existing information systems.

Against this background, a variety of human problems have arisen. Jobs have become fragmented. People believe that technology has taken control of their jobs, leaving them less able to respond to the unexpected. Supervisors may be ignorant of their subordinates' work. Basic skills may deteriorate. Chapter 1 of the report outlines this changing environment, and emphasises the need for organisations to remain adaptable and to create the right environment for change.

The changes involved are not simply a matter of technology. Better education is producing individuals who demand more than in the past, and whose needs are less likely to be met by rigidly defined jobs, for example. Behavioural theories discussed in Chapter 2 show that people work best if their managers encourage them to use and develop their skills and contribute their experience to the success of the organisation. The challenge for management is to realise this potential based on cooperation and earned respect.

At present, the wider aspects of change accompanying new information systems are often neglected. Organisational and human aspects are given limited attention, as is job design. The system design process has a technical emphasis. Education and learning, training and communication, and end-user influence are all limited.

The manner in which change is introduced will influence people's behaviour. When change is imposed from above or outside, those affected are likely to react negatively. When the people affected are actively involved in the change, they will respond positively and work harder to ensure success.

In practice, however, gaining the constructive involvement of end users is difficult. Participation can lead to increased time and costs, and most participative methods are inadequate. Users are likely to be sceptical, and management attitudes may be negative. Opportunities for participation are often limited, roles are easily misunderstood, and designers' attitudes may be negative. It takes time for users to adapt their way of thinking, and for participants to learn how to work together.

Different approaches to job design are described in the report (Chapter 3). The traditional scientific management approach, in which jobs are broken down into the simplest components and are defined precisely and completely, has resulted in deskilled and tedious jobs. The job-enrichment approach, as its name implies, aims at increasing people's motivation and job satisfaction. A third method, increasingly popular, is the socio-technical approach, which seeks the best match between technical and social systems.

In the overall design of systems, the conventional design process is well known but creates major problems in the context of rapid change. One step beyond this conventional design process is the participative approach, in which end users take part in the design process. A third stage is represented by Eason's evolutionary design process. This process is based on a technology that regularly informs designers of the needs and problems of users, and that helps users to learn in an evolutionary way about system facilities and how to exploit them.

The effective management of change depends basically on an organisation's management values and style, for it is these values that determine how constructively people are brought into the process of change. A positive management attitude is essential. Trade unions, concerned at the loss of jobs, will seek to increase their own involvement in the process of change. Legislation is tending to include broader areas of business interests; in the Nordic countries, legislation and agreements specifically provide for user involvement in the design of information systems.

Practical lessons in handling the human aspects of change arising from information technology are illustrated in six case studies in the report (Chapter 5). Though individual circumstances will affect the handling of the process of change, and there is no single blueprint for success, there is no doubt that the extent to which information systems users are involved in design and implementation is a key determinant of system effectiveness.

Finally, in a distillation of the lessons from the case studies and our other research, we present and discuss (Chapter 6) the following general guidelines for senior management:

—Foster a healthy environment for change.

—Secure top management support.

—Encourage the ability to change and learn.

—Acquire the necessary skills.

—Involve people appropriately and at the right time.

—Be open-minded as to who should be involved.

—Devote time to developing the participative process.

—Achieve a balanced pace.

—Adopt a facilitating role.

—Keep people informed.

—Think widely about opportunities for change.

—Monitor progress.

—Coordinate progress.

—Involve trade unions.

—Plan for incremental change.

—Obtain and develop the appropriate tools and facilities.

—Provide appropriate support functions.

PREFACE

Information systems are changing the way that organisations operate and the way that individuals perform their jobs. Yet when new systems are designed and introduced, the end users most affected are frequently not consulted. As a result, system features that could be beneficial are often overlooked. More importantly, end users feel disaffected because they are not involved in the process of planning changes that alter their own jobs.

Unless the nature and potential impact of these changes are understood and actively managed, there is a danger that crucial elements in the successful introduction of new systems may be overlooked. In addition, users may take direct action to delay or, even worse, obstruct the introduction of new information systems.

To implement new information systems successfully, managers need a basic understanding of the factors that influence how people behave, and how they are motivated, at work. They need to understand the likely prejudices, resistance and anxieties that users may have. Above all, managers need an understanding of how best to gain willing and constructive cooperation from end users, to help ensure the success of new information systems.

The purpose of the report is therefore to provide guidelines for successfully introducing new information systems, and for anticipating and minimising the impact of the problems that can arise as a result of the changes in nature and content of the jobs that are affected.

The report is aimed at all management services staff who are directly or indirectly responsible for introducing information systems. It is also intended to be of value to personnel managers and line managers.

Structure of the report

In this report, we draw extensively on the experience and insights gained from six case histories in which end users have been heavily involved in the process of change brought about by new information systems. The case histories are set out towards the end of the report, in Chapter 5. The earlier chapters are concerned with underlying behavioural and motivational theory, and with the general social, economic and legislative environment within which change takes place.

We begin in Chapter 1 with a brief review of the growth of information technology and its impact on jobs and the way businesses are organised.

Chapter 2 summarises the leading motivational theories. It then goes on to describe current thinking about people's behaviour at work, taking into account current economic and social trends.

Chapter 3 looks at the process of change, with the emphasis on human factors. It begins by reviewing how to obtain commitment to change. The chapter also reviews the success (or lack of success) of conventional approaches to system design in gaining commitment, and compares that with more recent alternatives such as the socio-technical approach. The chapter identifies and describes alternative approaches to the design of jobs.

Chapter 4 reviews the significance of management values and attitudes and how they influence the degree of attention given to human factors. The attitudes of trade unions are also discussed. The chapter closes with a brief look at trends in legislation and social accounting.

Chapter 5 presents six case histories in some detail. It describes the experiences of organisations implementing new information systems, paying particular attention to human aspects.

Chapter 6 presents guidelines for those engaged in undertaking change associated with the use of information technology.

The report closes with a brief Conclusion section, and a list of references that serves also as a guide to further reading.

Research methodology

The research for this report was carried out during the fourth quarter of 1983. First, the available literature was thoroughly reviewed. A list of references at

the end of this report illustrates the scope of this activity.

Next, discussions were held with organisations and individuals undertaking research and having practical experience in human factors and the process of change.

Finally, interviews were conducted with representatives of organisations who have undertaken, or are undertaking, change arising from the use of information technology.

We would like to thank all those who have contributed to the research for this report, particularly the representatives of organisations that provided us with case history material. Our thanks also go to the following for their constructive comments, insights, and participation:

— Oliver Tynan and Richard Smith at the Work Research Unit in London.

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CHAPTER 1

THE CHANGING ENVIRONMENT

Information technology is developing at an astonishing pace. As a result, businesses are having to adapt by changing the way they are organised and the way their employees work.

THE PACE OF CHANGE

The Greek philosopher Heracleitus once said "There is nothing permanent except change". In today's world we would certainly concur, although one doubts whether Heracleitus ever envisaged the changing environment that we currently live in. Many observers in recent times have remarked on the pace of change. Oliver Tynan, for instance, speaking at the 1983 UK Foundation Conference on the theme of managing change, emphasised that change will be large, penetrating and unpredictable.

Change today is occuring at a faster pace than in the past. In his book "The Third Wave", Alvin Toffler (Reference 1) illustrates this with examples. One is the typewriter, the patent for which was originally issued in 1714, though commercially available devices did not appear until 150 years later. Another example is the combine harvester, which was invented in 1836 and became commercially available 100 years later.

In today's world, the time between conception and birth of products is much reduced. The time between a product's introduction and its peak production also has shortened. For example, the average time between the introduction and peak production of a group of consumer products introduced in the United States before 1920 was 34 years; for another group of consumer products produced in the period 1939 to 1959 the time span had dropped to eight years. Today, the time span between introduction and peak production of many consumer electronic products is likely to be as little as one to three years. The economist Kenneth Boulding's view (as quoted by Toffler) is that a change which might take a generation to accomplish in a non-literate society can occur in days in a culture with mass communications.

Advances in information technology

No one can doubt the significant contribution that modern technology in general, and information technology in particular, is making to the rapid changes that are experienced today. Although much has been achieved through the use of information technology, the scene is set for an even greater impact upon organisational life and the nature of office work.

In a period of little more than 25 years, from the beginning of the commercial application of computing up to the present day, advances in information technology have been remarkable. Butler Cox has published key indicators of these advances in previous Foundation reports, examples of which are given here for illustration.

Raw power-to-price performance of computing hardware has improved on average by about 25 per cent each year during the 25-year period of commercial computing. The current worldwide population of installed computers is about 125,000 mainframes, one million minicomputers, and already four million microcomputers. The number of computer terminals installed is about seven million worldwide. Dr Louis Robinson, Director of University Relations for IBM, noting the growing penetration of terminals in business, foresees the day when every job holder in the information sector (already the majority of workers) will be equipped with a terminal. Business microcomputers are proliferating and advances in the ratio of price to performance are substantial. Sinclair announced in early 1984 its QL microcomputer with 128K memory, priced at about $600. Travellers Insurance of Hartford, Connecticut, has ordered 25,000 IBM PCs for its agents. United Technology of Hamilton, Connecticut, has placed a single order for 1,200 PCs, one for every senior executive.

Dr Richard Byrne believes the advent of the microcomputer to be of such significance that all that has gone before is in the pre-microcomputer age, and all that follows is in the new microcomputer age, as he discussed at the 1983 UK Foundation Conference. Gordon Scarrott's opinion (Reference 2) is that we have moved from an essentially how-to-do-it phase into a what-to-do-with-it phase. Suppliers are many and competition is fierce. Product life cycles are shortening, as evidenced by Hewlett-Packard's decision not to release a planned enhancement to its HP3000 series (based on the Vision project) but to

await instead the release of a new generation of computers based on more advanced technology.

Although less spectacular, improvements in software are also very significant. This is illustrated by the increasing proportion of investment in new information systems which is accounted for by software development and system implementation. In one company, the hardware component in a major new information system investment is worth less than ten per cent of the total of about $30 million.

There is a growing trend towards software products that are more suited to the needs of end users and easier for them to use. Software tools that enable users to develop their own applications are increasingly evident. Improved software development tools are also becoming readily available, and significant improvements in the productivity of generated software (up to 20-fold in some instances) are being achieved.

All these developments are encouraging wider use of information technology and fuelling the pace of change.

THE EFFECTS OF INFORMATION TECHNOLOGY

Despite frequent early traumas, most organisations using information technology agree that the effect has been beneficial. Typical benefits include cost avoidance, cost saving, improved standards of service, improved ability to handle increasing volumes of business, and improved competitiveness. To these benefits must be added the contribution that information technology can make to solving problems that cannot be solved effectively by other means. A good example is international airline reservation systems, which enable reliable and responsive attention to travel needs. Another example is in banking, where information technology has enabled the banks to handle an increasing volume of money-transfer transactions, both nationally and internationally, and to provide new and improved services such as international cash management. Systems like this, which are largely taken for granted by the general public, would have been impractical in any other way.

The application of information technology has already advanced beyond the traditional areas of administrative and management information systems to new areas such as the office and the customer interface. Although there are still many batch applications, online applications are growing rapidly in number. Information systems are moving beyond the traditional boundaries of organisations. Customers increasingly play a direct role in the operation of systems, for instance as seen in the introduction of automated tellers (ATMs), the use of videotex services for data collection and order entry, and the slowly emerging electronic funds transfer systems.

The implications of information technology

Information technology is currently passing through a transitional stage typical of earlier technologies. At first, a new technology assumes the guise of that which it is replacing. The motor car, for example, originally appeared as the horseless carriage. Later the new technology is applied in new, and originally unforeseen, ways. Pava used the term adaptation, as opposed to adoption, to illustrate the changing emphasis, in his talk at the UK Foundation Conference in 1983. An example of adaptation is the use of computer-aided design to prepare and assemble individually tailored suits.

Often the new technologies are themselves the prime cause of change. For example, Bjørn-Andersen (Reference 3), in a study of five European banks, identified the technology itself to be the most important driving force behind the introduction of new systems.

The implications of all these developments are profound. Information technology is enabling organisations to develop their business in new ways, and the new technologies are contributing to new business opportunities and ventures. For example, Verbraucherbank in West Germany is using the public videotex system to increase its market penetration without extending its branch network.

The man in the street is becoming increasingly aware of the potential of information technology and increasingly familiar with it, through exposure to devices such as automated teller machines and home computers. Governments are increasing their expenditure to spread the knowledge. Schools are acquiring computer systems and providing basic training in computing skills. Many parents are encouraging their children to learn about computers, hoping that such knowledge will better equip them to face the future.

Today, there is a growing trend for information technology to be used for less formal activities than before, and by more non-specialist users. The impact is particularly significant in the workplace. More and more jobs are being affected — often in ways that are hard to predict beforehand. Many examples have been quoted of the unforeseen consquences that can arise. At the 1983 UK Foundation Conference Buchanan related the problem associated with the automation of a biscuit-making process. The doughman's job was de-skilled to such an extent that he became bored and careless and his skills eroded. This job grade ceased being a source of supervisory and junior management talent — an aspect that had not been foreseen and caused much concern to senior

management. Another example is provided by British Leyland's car stock locating system for its dealer network. The system enables dealers quickly to locate cars that are available in the dealer network, so helping them to improve their service to customers. The dealers have been able as a result to cut back on their own stock holdings, a consequence that had not been foreseen.

THE EFFECTS ON ORGANISATIONAL STRUCTURE, PROCEDURES AND JOBS

Information technology can provide organisations with the opportunity for improving their structure and procedures, yet often this opportunity is overlooked. What is more, some organisations have developed, through the use of information technology, organisational characteristics that make further change more difficult to achieve.

There have been many studies and much comment concerning the effects that information technology has had on organisational life (see, for example, articles by Briefs, Reference 4; Bjørn-Andersen, References 3 and 5; Groholt, Reference 6; and Kraemer, Reference 7). In summary, their findings point to the following trends:

- —Increasing formalisation, specialisation and standardisation of procedures.
- —Reinforcement of patterns of influence and power.
- —More cases of centralisation of power.
- —More rational decisions taken within more rational organisational structures.
- —General freezing of working methods and practices.

There have also been many analyses published on the effects of information technology on office jobs, from which a general consensus of views can be deduced. By way of illustration, we summarise some of the relevant research findings:

Effects on work skills

In his study of the effect on work skills of new information systems implemented in five European banks, Bjørn-Andersen and his co-researchers found that batch systems tended to decrease task variety (Reference 3). Online systems, on the other hand, tended to increase it, often as a consequence of a smaller series of tasks taking over from larger routine tasks. The researchers also found that there was more on-the-job learning with online systems, and that this was associated primarily with the technical aspects of the systems.

In contrast a fragmentation of skills, with an accompanying loss-of-view of the whole activity, has been identified by Cooley (Reference 8). Pava reiterates this. He claims experience suggests that users' thinking can become unconsciously constrained by what appears on a visual display screen. As a consequence, basic skills associated with original ways of working deteriorate over time. As an example, Pava identifies commodity dealers working with computerised dealing systems.

Bjørn-Andersen found that employees in the five banks acquired a mechanistic attitude to work, with the result that they were unable or unwilling to cope with unexpected situations.

Effects on job content

There seems to be almost universal agreement that information technology has led to the elimination of some routine, boring and monotonous tasks. Groholt (Reference 6) refers positively to the way information technology has solved problems that otherwise were not capable of practical solution. However, there also appears to be a consensus that jobs have become fragmented, with a corresponding loss of an overall feel for the job.

Effects on job satisfaction

According to Bjørn-Andersen, changes caused by information systems have been insufficient either to raise or lower levels of job satisfaction.

One common area of concern is that, increasingly, people are losing control over the way they perform their work. The fear is that work tempo is being set by the technical component of systems and that human activities are becoming subordinate to the machine.

Jobs which have become more structured have also become less flexible, so job holders are less able to respond to new requirements or unexpected events. Employees have sometimes also lost the ability, and probably the desire, to take local initiative. An illustration of this is the substantial reduction experienced by some organisations in employees' support for internal company suggestion schemes. Banks are also reported to be concerned that their branch staff are becoming less able to respond to customers' needs because of constraints imposed by new information systems.

Effects on supervision

The National Economic Development Office (NEDO) has reported that supervisors' jobs are shifting from controlling the people to controlling the process of work. At the same time supervisors are losing detailed knowledge about the work their subordinates are doing.

The organisational consequences

From these findings, it is clear that experiences of the effects of information technology on jobs are

mixed. There is some indication that, despite little specific attention, recent implementations of information technology are an improvement on earlier implementations, from the standpoint of job content.

Many organisations are becoming increasingly rigid as a result of the way they have implemented information technology, and so are poorly equipped to respond to an increasingly competitive and fluid environment. The formalisation of structure and procedure, a product of the skills, methods and tools used for implementing information systems, has contributed to this organisational rigidity. These characteristics contrast with those described by Peters and Waterman in their book "In Search of Excellence" (Reference 9) about their view of the best-run companies in the United States. "Excellent companies ... keep things small, maintain a rich informal environment ... facilitate organisational fluidity ... Tidiness is sacrificed and efficiency is gained."

Future organisations

In his book "The Third Wave", Toffler describes the characteristics of the new emerging organisations — the third-wave organisations — which have fewer organisational layers. Layers consist of small organisational components often linked together in temporary structures, each component having its own relationship with the outside world. Ferguson in "The Aquarian Conspiracy", (Reference 10) says that there is a definite trend towards decentralising power — to dismantling the organisational pyramid. Peters and Waterman describe the concepts of organisational fluidity — "adhocracy" as opposed to bureaucracy, and "chunking". By "adhocracy" they mean the ability to respond quickly to new requirements by establishing new and probably temporary organisational structures and procedures. By "chunking" they mean creating small short-term and effective working groups to investigate a problem or opportunity, and implementing solutions.

Many of these organisational developments are in response to a more segmented and rapidly changing marketplace, and the desire to respond successfully to the needs of customers in competitive situations.

Strassmann (Reference 11) claims that, to cope with increasing variety, many organisations have developed complex internal procedures. Strassmann measures procedural complexity by his so-called Parkinson Ratio — the result of dividing the number of internal communications by the number of communications from customers. For very efficient organisations the Parkinson Ratio lies in the range 20 to 30. For service sector companies a range of 50 to 80 is usually the minimum. For public sector organisations the range is from 100 to 300. Strassmann attributes these large ratios to the number of staff needed to administer and control the organisation of information.

Strassmann believes that it is possible to eliminate the separation between managerial and operational tasks. This, he believes, provides the greatest opportunity for improved productivity. Tasks would be completed by close co-ordination within small manageable groups, located as close as possible to customers. Organisations of this type, Strassmann believes, would have a Parkinson Ratio of less than 10.

In summary, the organisational trends seem clear: towards smaller, decentralised groups with reduced managerial overheads. Information technology can make a significant contribution towards, and in some cases can facilitate, organisational changes of this sort.

However, there are two important aspects of change that organisations need to understand. One is the need to create the right environment for change to occur. History supports the view that most organisations can usually accommodate change successfully only on an incremental basis. Those organisations that undertake major change will require the best of management skills to meet successfully the challenge of change. The second aspect is the need for organisations to remain adaptable to continuing change. Achieving this depends on choosing the appropriate approach, tools and techniques, and on developing the skills and understanding of employees.

CHAPTER 2

MAKING CHANGE WORK: THE INFLUENCE OF PEOPLE'S BEHAVIOUR

In this chapter we review the behaviour of people at work. Our purpose is to provide a base for understanding, upon which strategies for change can be securely built.

The conclusion of those who have researched the field is clear: organisations need to take account of people and their behaviour in order to make the most of the opportunities when change is being undertaken.

PEOPLE'S BEHAVIOUR AT WORK

We begin by identifying people's attitudes to work by reviewing pertinent behavioural theories. We also review social and economic factors as far as they affect people's behaviour at work. (A fuller discussion of these theories can be found in Howarth's book, Reference 12.)

Maslow's Hierarchy of Needs

Maslow's investigations have been widely quoted. They were based on a study of healthy and mature people. Maslow found that people's behaviour was influenced very largely by attempts to satisfy certain needs. He arranged these needs in five levels. Once basic needs at the lowest level are satisfied, such as the need for food and water, people's attention turns to needs at successively higher levels. At the highest level is what he termed 'self-actualisation' — the need to make the most of one's individual potential. If needs at any of the five levels are not met or are frustrated, Maslow suggested, people suffer. Just as surely as people's physical health suffers through lack of nourishment, so their mental health suffers if they are deprived of the opportunity to fulfil their potential. Their performance will also suffer as a result.

In Maslow's view, organisations cannot operate near their optimum without their employees being given the scope to satisfy their personal needs at the highest level.

McGregor's Theory X and Theory Y

McGregor's researches related to basic assumptions that managers make about people, and their consequent effect on people's behaviour. McGregor identified two basic views which he termed 'Theory X' and 'Theory Y'.

He found that much managerial policy and practice reflected Theory X. This states that most people dislike work and avoid it if possible. They must therefore be controlled. They lack ambition, avoid responsibility, seek security, and prefer being directed. Managers operating according to Theory X assume that people will not make an effort unless directed and controlled.

McGregor has suggested that the problem with a Theory X method of management is that in practice it actually encourages people to behave as if they were lazy and irresponsible. So he went on to suggest that people would work better if managed on a different set of assumptions, those of Theory Y. According to this theory, people want to work because work can be a source of great satisfaction. If a person takes pride in his work, he will motivate and control himself. Pride and commitment depend on what a person gets out of a job — and the most significant rewards are not financial. When someone takes pride in his job, he gladly accepts and even seeks responsibility. Ability to use initiative and imagination in solving work problems is not confined to a few high-calibre people. The way work is organised and managed taps only a small proportion of the average person's potential.

McGregor asserts that, if a manager works according to this view of people, his subordinates will respond by taking responsibility and working hard for the success of their organisation.

Herzberg's Motivators and Hygiene Factors

Herzberg's approach, in contrast, was to focus on the nature of the jobs that people do and the effect that job content and context can have on performance. Herzberg emphasised the differences in causes of satisfaction on the one hand and dissatisfaction on the other.

Lasting satisfaction comes from factors to do with the nature or *content* of work: the inherent interest

of the work, the challenges it provides, the responsibility it carries, and the opportunities for personal achievement, development and self-respect. It is these factors, labelled motivators by Herzberg, that create willing effort. (They are equivalent to those of Maslow's higher-level needs.)

Dissatisfaction, on the other hand, results from factors associated with the *context* of the job, such as the nature of company policy and administration, managerial and supervisory practices, human relationships, working conditions, and the amount, security and system of pay. Herzberg referred to these as hygiene factors. (Hygiene in the medical sense helps prevent disease, but does not positively generate health.) People may not be dissatisfied if they feel well paid and well managed and if they work in pleasant surroundings, but these factors alone will not motivate them to give of their best. They may go on doing their job, but managers would still have to continue using the stick or carrot, in McGregor's terms, to ensure the minimum effort required by the organisation. (We discuss job enrichment in more detail on page 12.)

The relevance of the theories

The behavioural theories of Maslow, McGregor and Herzberg have their limitations. Nonetheless, they are relevant in practice. They suggest that, far from working best when directed and controlled, most people work best if their managers encourage them to use and develop their skills and contribute their experience to the success of the organisation.

These findings are not new. What makes them pertinent today is the effects that changing economic and social conditions are having in the industrialised western world. These changes are influencing people's attitudes towards work and their behaviour at work, and increasing the relevance of the theories we have reviewed.

CHANGES IN THE WORK ENVIRONMENT

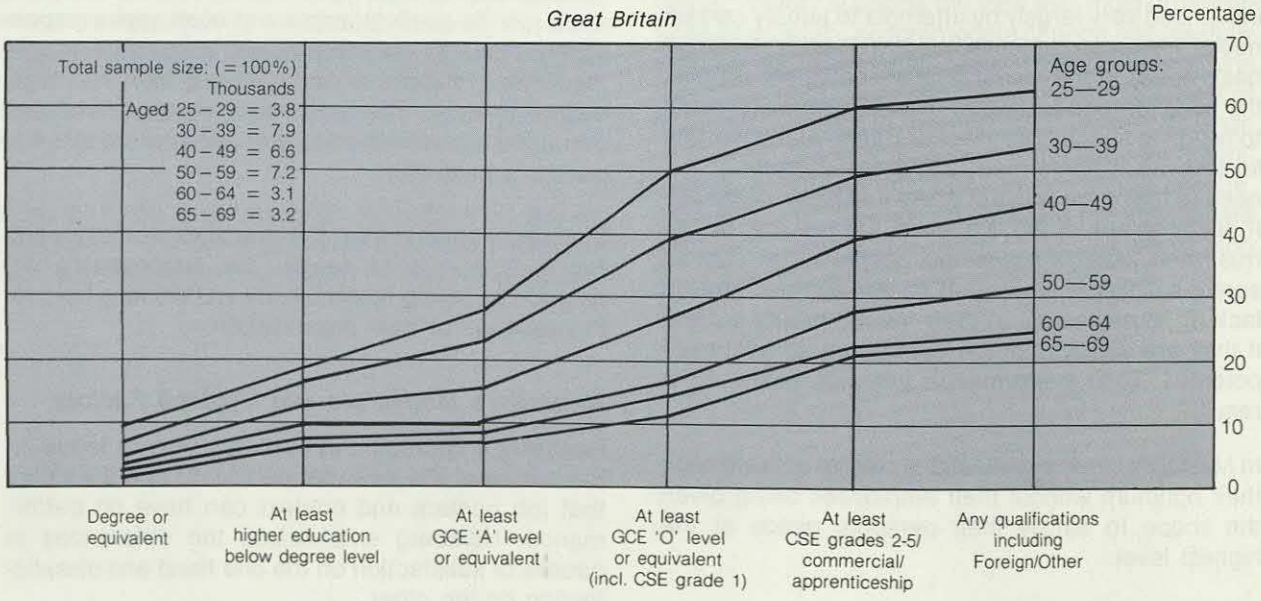
It is easy for those of us who live in the developed nations of the world to overlook how well-off people are. Standards of living generally continue to improve, although there has been some slow-down in recent years. There are few really poor people in Western Europe. The economic need for employment is decreasing. The well-established welfare systems are largely able to provide for those in true need.

Changes in education

People are becoming educated to a higher level and in different ways, as illustrated in Figure 2.1.

Methods of teaching are today less authoritarian than in the past, with increasing emphasis being placed on developing the ability to learn, and to applying in practice what is taught. The result is people who are more questioning than submissive, more able to decide for themselves, more individualistic; and at the same time, less compliant and accommodating.

Figure 2.1 Highest qualification level of the population: by age[1]



[1]People aged 25 – 69 not in full-time education, based on combined data for 1979 and 1980.

Source: General Household Survey.

The effects on people at work

In this report, we can only give a few indicators of the totality of economic and social change that is occuring. The point is that much of this change is being brought into working life.

Because our basic needs are now catered for most of the time, they have become less of a concern. To put it bluntly, people at work can no longer be treated as a commodity. There is also much legislation and trade union presence to provide a measure of job security. Better education is producing individuals who demand more than in the past, and whose needs are less likely to be met by rigidly defined jobs. Their questioning attitudes are being brought to the work place. Roeber, for instance, believes that organisations are losing the power to coerce employees into the modes of behaviour that organisations would prefer (Reference 13).

There is evidence of a growing anti-work attitude. As one highly articulate and educated student expressed it: "I will contribute very little to the grossness of the national product". The trend is illustrated by those who choose to follow a lifestyle of voluntary simplicity, and by the growing number who prefer the dole queue to the job. These expressions of behaviour are at present materialising only amongst the minority, yet negative attitudes are also evident in many who continue to work, in the form of absenteeism, lateness, and apparent sickness.

At first sight, it may appear that McGregor's Theory X approach is called for to manage such workers. But what is needed in practice is not increasing control and direction. Rather, the need is to elicit people's positive enthusiasm.

It is clear that organisations need to learn ways of eliciting voluntary commitment. Few people can be reliably motivated by money to work hard. In Howarth's view, it is important "to pay attention to everything which encourages willing effort and makes it possible for people to use their initiative and experience, not just day-by-day in their jobs, but in shaping their organisation's response to the changing world in which it operates".

HUMAN FACTORS AND ORGANISATIONAL HEALTH

There is an analogy to be drawn from the medical field that is pertinent to the topic of human factors in organisational life. Concern has arisen in the medical profession that medicine has become too technical. Doctors too often have turned to prescribing drugs or recommending surgical treatment. Too often it is the symptoms that are treated, rather than the causes. To counteract the tendency, a growing number of medical practitioners are exploring the concept of holistic health — taking account of the needs of the whole person.

Similarly, the holistic health of organisations can be seen as dependent on all the factors that condition the success of organisational endeavour. Among those factors are the human ones. Rene McPherson, chairman of Dana, is quoted by Peters and Waterman as claiming that almost everybody agrees that "people are our most important asset", yet almost none really practise it. Those organisations that strive for success and achieve it are noted for the attention they give to their employees' needs. One well-known example, Procter and Gamble, has been guided by the principle of its founders: "the interests of the organisation and its employees are inseparably connected".

The real stimulus comes from work that provides interest, challenge and scope, and from managers who treat people as adults, encouraging them to develop their skills and to use them effectively. The challenge for management is to release the potential of its employees based on cooperation and earned respect, rather than compulsion. To succeed in a competitive and unpredictable world, organisations need to make full use of their employees' ideas and experience when deciding upon changes that are needed.

CHAPTER 3

MANAGING THE CHANGES CAUSED BY NEW SYSTEMS

From the standpoint of the users, introducing a new computer system inevitably spells some degree of change. In this chapter we first review how in the past organisations typically have failed to take full account of human factors when designing and implementing new information systems. We go on to identify how users' commitment can be obtained, and consider early experiences with approaches to the management of change that are built upon user involvement. We also briefly review job design and the benefits of accommodating users' on-the-job experience and learning. Finally, we examine a possible model for managing change that appears to provide significant advantages.

Although early experiences are varied, a growing number of organisations today are using approaches aimed at accommodating organisational and human factors. Advances in software facilities are occurring that enable technical components of systems to be developed more quickly and effectively than before, and that support users' needs for the purpose of experimenting. In future, more organisations will take the opportunity provided by these advances.

FAILINGS OF CONVENTIONAL APPROACHES

At the end of the previous chapter we indicated the benefits that organisations could obtain by making full use of employees' experience and ideas to help the process of change. The extent to which managers take advantage of the opportunity will largely depend on the way change is introduced.

Typically, change brought about by information systems is technically oriented and imposed upon people.

The Foundation has already addressed the topic of systems development methods in Foundation Report No. 25. In that report, comparisons were made between two ways of viewing the system development process: the traditional, 'closed-system' view, which sees a system as essentially a closed assembly of technological components surrounded by a well-defined boundary; and the emerging 'open-system' view, which sees a system as an ever-changing organism in which different components interact with and modify each other.

Those who take a closed-system view strive to define the boundary of the system fully and completely. In the change process, they concentrate on making preselected technology work within a fixed specification. The change process is undertaken by specialists and highly skilled technicians. The emphasis is on the engineering of the system.

Although most of those responsible for developing systems have progressed from the strictly closed view of systems, their development approaches have originated from that view and are still rooted in that way of thinking. That this origin prevails is apparent from widely reported observations of the failings of current change processes. We summarise these observations in the paragraphs that follow, drawing on the findings of Land et al (Reference 14), Bjørn-Andersen et al (Reference 3) and Docherty (Reference 15).

Organisational and human aspects are given limited attention

Often existing work organisation and job content are not seriously questioned. Few attempts are made to challenge or seek to change the current work organisation, work roles or communications channels. The result is that new systems are expected to fit the organisation and few job changes are expected. Moreover, management services staff often expect other departments to be responsible for work design and job content, although these other departments often rate their own influence as small at best.

Technical systems designers often see the technology as a means of tightening up processes and procedures, so overcoming problems that they perceive to be caused by the weaknesses of people.

Usually when computer-based systems are implemented there is no intention of changing the organisation. When change does occur it is usually unforeseen, often impairing the normal functioning of the system, and taking both designers and users by surprise. The scope of the change process as it generally exists today is illustrated in Figure 3.1.

The design process has a technical emphasis
Conventional approaches to system design are often heavily biased towards obtaining the best use of the technology. Computer specialists often pay more attention to the technical components of a system than to ensuring that the resulting system is effective.

Job design is given limited attention
In practice, job design is usually limited to the physical design of dialogues. (Job design methods are not usually taught to trainee designers.)

Methods of compensation emphasise technical merit
Designers and implementers are judged more on the technical excellence of a system design than on its effect on the organisation. Often, tight project deadlines positively discourage management services staff from explaining alternative designs and their potential impact on the organisation.

Evaluation and learning is very limited
Methods of system design often exclude measures to evaluate systems after implementation and to accommodate changes as a result of users' learning and increasing competence.

Users who have contributed to the design do not see the consequences of their contribution until after a long development cycle. So the link is weakened between design decisions made by or with users, and the resulting operational system. Users' learning is weakened as a result.

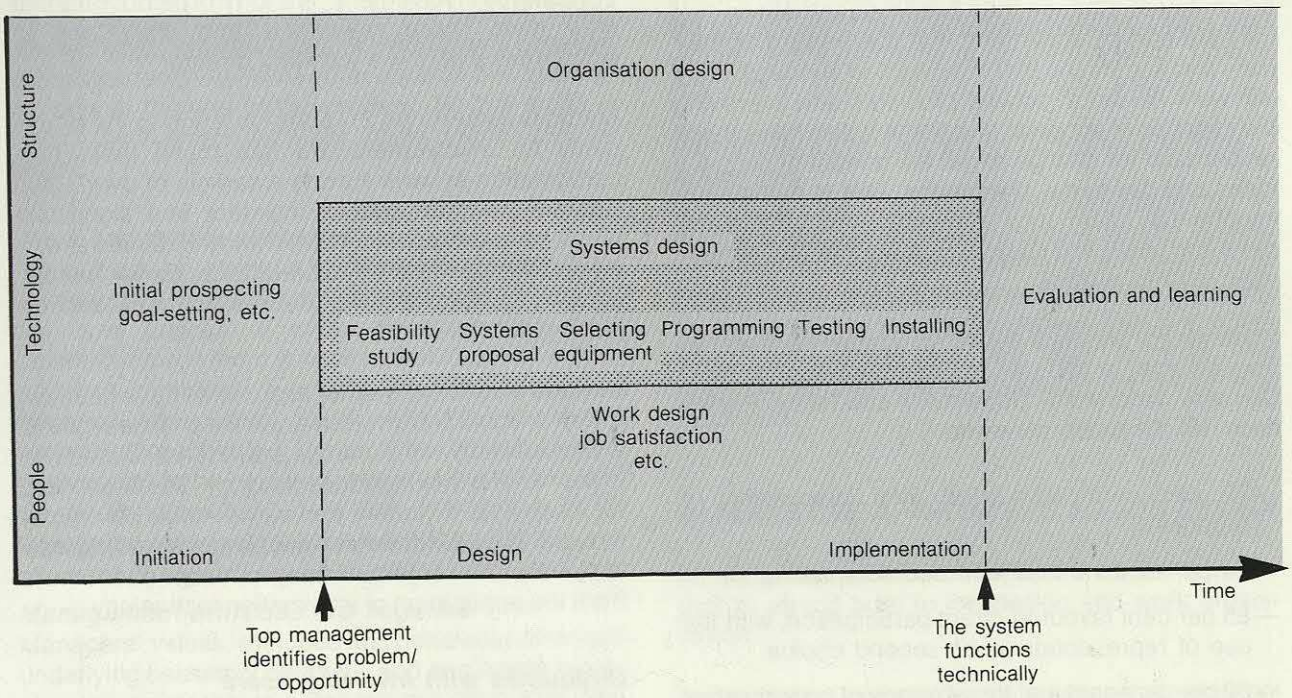
Training and communication are limited
Training and communication are usually included in the change process, though often only to a limited extent. System designers' perception of training is frequently one of merely instructing people in the use of equipment and other technical components of a system. The norm is to tell employees at the outset that something is happening, filling in the details later on.

End-user influence is limited
Those with most influence on system design are primarily the management and staff of management services departments, and only secondarily the user managers.

This problem is probably exacerbated by the apparent lack of suitable mechanisms for users to articulate their views and make their choices.

Figure 3.1 The scope of the systems design process

This figure illustrates how, in the conventional systems design process, the systems designer's main focus is on the technical aspect of systems design (shaded, in the illustration). The technical aspect is only a part of the process however. The remaining parts (shown unshaded) include organisation design, and work design.



Source: Bjørn-Andersen et al (see Reference 3)

INVOLVING PEOPLE IN THE PROCESS OF CHANGE

The way change is introduced can affect people's behaviour. As predicted by Maslow's hierarchy of needs and Herzberg's motivators and hygiene factors, omitting people's contributions ultimately diminishes their satisfaction. Those end users having no responsibility in the change process regard change as none of their concern. As a result they give the appearance of behaving irresponsibly — either by passively acquiescing or by overtly resisting change.

Resistance is perhaps the most common reaction of people when change is imposed upon them. Resistance manifests itself in many ways, from openly negative reactions such as withdrawal of labour, open hostility and defiance, to covert ways such as absenteeism, apathy, and reduced quality of work. People who resist change are well able to undermine the effectiveness of a new system, and to repeal decisions that others have made on their behalf once these others have left the scene.

In contrast to this bleak scenario, the process of change can be presented as potentially exciting, challenging, and stimulating, eliciting quite a different response from those affected. People who are given a chance to use their ideas and experience responsibly are most likely to work for success.

The need for involvement

It follows that managers implementing change should involve those who are affected, in order to gain their commitment. Change then becomes something that they are part of, something that they regard as their own, and something that they want to succeed. They will work harder at solving problems and improving the chances of success. Involvement also helps those responsible for change to get the benefit of people's ideas and day-to-day knowledge. This is particularly important as information technology affects more and more end users and impacts in ways that are increasingly hard to predict.

Evidence for people's desire for involvement comes from a survey of 450 staff in one organisation in West Germany, reported by Oppermann and Tepper (Reference 16). Of those surveyed:

- —79 per cent advocated joint discussion of proposals.
- —74 per cent wanted joint decision-making.
- —85 per cent favoured direct participation, with the use of representatives as second choice.
- —62 per cent said that the absence of opportunities to influence decision-making was an important reason for their non-participation.

Although the survey supported the desire for involvement, it also indicated that the staff were resigned to a lack of genuine opportunities for involvement: 64 per cent of those surveyed thought that their superiors' decisions would prevail.

The increasing desire for involvement is also indicated in Bjørn-Andersen's study, which noted that 79 per cent of clerical staff in savings banks in the Netherlands in 1977 wanted to influence the system development process, compared with only 30 per cent in 1974. Eason, however, puts a slightly different emphasis on the demand for involvement (Reference 17). He believes that people are becoming increasingly aware of change and want to take steps to control it. Furthermore, he believes, people are becoming more certain of their needs. No longer is it necessary to be an expert to know what one wants. Engberg (Reference 18) believes that data processing specialists should prepare themselves for developing information systems on users' terms, adding that specialists "must expect there to be less and less enthusiasm (for specialists' work) among a large section of society".

Many others are adding their voices to the call for involvement. Mulder (Reference 19) describes involvement as "the most vital organisational problem of our time . . . It will change the leadership function of the more powerful, and new structures for leadership, decision-making, and communications will develop . . . For the individual members, feelings of well-being and their sense of self-realisation are related to participation and its consequences." Den Hertog (Reference 20) believes involvement "is a form of democracy that may have more relevance and advantage to employees than say a workers' director".

Margolis (Reference 21) adds his voice to the proponents for involvement. He has found that "non-participation at work among a sample of over 1,400 workers was the most consistent and significant predictor and indicator of strain and job-related stress. It was also significantly related to health risk factors, such as escapist drinking, depressed mood, and low job satisfaction".

Besides these, many other arguments have been put forward supporting involvement in the change process, and particularly in the change process associated with implementing information technology. The latent need for involvement is more pervasive than is commonly thought. The call for involvement is expressed increasingly within the context of change. Change often results from the application of information technology.

Difficulties with involving users

In practice, gaining the constructive involvement of users is not at all easy. There are two general areas

of difficulty. One concerns the early difficulties experienced both by users and technicians in making the transition to new ways of working. Everyone is learning and time is needed to allow the learning to take place. The second area of difficulty concerns today's methods and techniques, still largely based on traditional approaches, that are used to design the technical components of systems. What is needed are methods and techniques conforming more to the open-systems view described in Foundation Report No. 25, System Development Methods. Several investigators, when reporting studies of both socio-technical and participative approaches to involvement in change, have identified difficulties encountered in practice. These difficulties are summarised in the paragraphs that follow.

Time and costs increase
There are penalties in time and costs which appear to be much higher than with a conventional approach. The analysis and design processes seem to require greater effort, because the scope of analysis is wider. The participatory process requires time for resolving conflicts and disagreements. Time is also required for users and designers to learn the basic skills needed for effective involvement.

Methods for involving users are inadequate
Most participative methods, such as the use of steering groups, concentrate on creating and maintaining organisational structures for managing the process of change. Often they neglect the need to involve people practically in the design and construction of computer systems. Methods of system development usually spotlight certain elements of a system. These elements become the focus of discussions between users and designers while other aspects become visible only at the end of the process. So the areas in which involvement actually takes place can be limited.

Users are mainly sceptical
The attitude of users to involvement varies widely from goodwill to hostility. In the main, users are sceptical and critical — often because their past experience leads them to believe that in practice their influence is minimal. Ensuring the right balance of influence and control is no easy matter. Users become disenchanted when they perceive their involvement to be merely a gesture. Technical people, on the other hand, feel their prerogative to be threatened when users take a leading role.

Management attitudes are negative
Managers' values, attitudes and behaviour often are underlying causes of difficulty, and can inhibit a constructive approach to resolving the difficulties that inevitably arise in the early use of participative approaches.

Opportunities for user influence is limited
Because of time pressures, users in practice often have a limited time-window during which they can influence the design.

Roles are misunderstood
It is often difficult for participants in a multi-disciplinary team to understand one another's role and problems, and what each is able to achieve. Users' understanding of the need for information and its relevance to the design of the technical components of a system often falls short of the designers' usual desire for precise and specific answers to their questions.

Designers find it hard to alter roles
Technical staff often have difficulty in adopting a role of assisting users, rather than being assisted by them. Designers are more familiar with anticipating the interests of users and taking decisions which they believe to be in the interests of users, without first consulting them.

Designers' attitudes are negative
Designers often regard the contributions of users as naive, short-sighted and obsolete. The designers' desire to design components of systems that are technically interesting is often more important to them than are users' ideas.

Skills required by users take time to acquire
It may be difficult for users to adjust their thinking from the orientation of their normal jobs to the more reflective and analytical one required for effective involvement. Users are often not familiar with making explicit their ideas and expectations. Users also usually lack experience in problem-solving. Time is required to allow users to learn and adapt.

Participants are unused to handling conflicts effectively
It is difficult for users to understand systems terminology, especially in the early stages, and for system designers to understand business and operational needs. Users and technical staff alike are generally inexperienced in resolving constructively and effectively the conflicts that are likely to arise. The approach is often one of appeasement rather than resolution.

ALTERNATIVE APPROACHES TO JOB DESIGN

To realise the potential benefits of change it is important to attend both to job design and work organisation.

In this section we begin by reviewing the conventional scientific management approach to the design of jobs. Next we look at two more recently developed

approaches to job design: job enrichment and the socio-technical approach. Finally we describe an evolutionary strategy for the process of change that has been proposed by K D Eason.

Scientific management approach

The traditional scientific management approach to job design is mostly associated with the principles expounded by Frederick Winslow Taylor at the beginning of the twentieth century. The approach has as its objective the maximisation of prosperity for both employee and employer, by encouraging employees to work harder. According to Taylor, "All possible brain work should be removed from the shop floor and centred in the planning or laying-out department. In my system the worker is told minutely what he is to do and how he is to do it, and any improvement he makes upon the instructions given to him is fatal to success."

Under Taylorism, jobs are broken down into their simplest components. First they are timed, then slow and redundant actions removed. Pay-rates are set accordingly. Employees are selected 'scientifically' and trained to suit the requirements of the job. Motivation is provided by the prospects of high earnings.

Scientific management has influenced the design of many jobs — clerical as well as manual, and even managerial. The approach is the foundation of the work-simplification school. According to Howarth, it is based on the "illusory hope of making the unpredictable predictable and of controlling the uncontrollable".

The de-skilled and tedious jobs created by the approach have had many unfortunate effects ranging from lax performance to sabotage. Some of the organisational consequences are absenteeism, lateness, sickness, high employee turnover, high requirement and training costs.

R F Hoxie (Reference 22), writing in 1915, is reported to have said that most of those applying scientific management did not recognise the humanitarian and social problems they were creating, nor that these problems were undermining the potential economic benefit.

More recently other approaches to job design have become popular, each looking at the relationship between people and tasks. The two most influential and most frequently used are job enrichment and the socio-technical approach.

The job enrichment approach

Job enrichment originated in the work of Frederick Herzberg (see page 5) and has been widely used for manual, clerical and managerial jobs. It aims to increase people's motivation, and thereby their efficiency, by increasing job satisfaction. It concentrates on the content of jobs and deliberately tries to improve the interest, challenge and responsibility of work. In outline, the process of job enrichment involves:

- Identifying jobs where problems of motivation seem to be causing performance problems.
- Analysing the jobs to identify the scope for improving work interest and responsibility.
- Determining which specific improvements to introduce — often using creative thinking (brainstorming) sessions involving line managers, internal and external advisers, trade union representatives and other job holders.
- Evaluating the feasibility and advantages of the ideas from the motivational as well as practical points of views, and selecting the changes to be introduced.
- Allowing people time to try out the new ways of working as and when they feel able.
- Introducing the changes over an experimental period typically as long as a year, often using 'before' and 'after' measures of job satisfaction and productivity, in both experimental and control groups.
- Evaluating the changes and deciding whether to introduce them more widely.

Job enrichment is illustrated by the work of J Hackman and G Oldham. Their job characteristics model for improving the jobs of maintenance programmers has been reported in EDP Analyzer, May 1983. The approach has been criticised, however, notably by Howarth. Practical problems have included failure to involve job-holders and trade unions in the design of new jobs, an over-readiness to accept technological constraints, and over-concentration on the job content without due consideration of the potential organisational changes or the practical implications.

Nevertheless the principles of job enrichment have proved well-founded and have been embedded in other approaches, of which the socio-technical approach is perhaps the best known.

The socio-technical approach

The socio-technical approach, which originated in research at the Tavistock Institute in London, involves analysing both the *social* system (the way people are organised when working on the technical system) and the so-called *technical* system, and also the interaction between the two. The socio-technical approach attempts to seek the best match between social and technical systems. Its rising popularity is due to grow-

ing dissatisfaction with the job enrichment approach and a widening recognition of the significance of technology.

To some practitioners the socio-technical approach is a broad approach. To others it is a particular method. Indeed, some practitioners have developed very specific methods which they label socio-technical. Two examples are the socio-technical method described by Pava at the 1983 UK Butler Cox Foundation Conference and the participative approach of Mumford (References 23 and 24). The guiding principles of the socio-technical approach are that:

—There is a whole range of workable social systems for any one technical system.

—Using cohesive and autonomous groups, a feature of the approach, makes for higher job satisfaction, commitment and productivity.

—It is best to design social and technical systems together.

—A socio-technical system cannot be isolated from its environment, so it is necessary to relate the two.

—People affected by change should have a say in the formulation of change.

—Emphasising the technical system at the expense of the social system (or vice versa) jeopardises the outcome.

CONSIDERATIONS IN JOB DESIGN

Two important considerations in job design are the man-machine interface and adaptive learning.

The man-machine interface

An important element of job design is the interface between man and machine. This subject has probably received more attention from researchers than any other aspect of human engineering. There is a great deal of experience and a wealth of published material on the principles involved. However, it is worth drawing attention to one particular aspect of the design of jobs.

A characteristic of many jobs affected by automation is the loss of control that workers experience over pacing their work. As office workers become more dependent on automation, so this problem will become more prominent, and designing the interface between man and machine will become more important.

Docherty (Reference 25) has reported on research at IBM into response time and users' effectiveness. Docherty's research, based on earlier work by S J Boies on the use of interactive computing services, is now referred to as Boies' phenomenon. The research has demonstrated that decreases in system response time can disrupt the human thought process. When response times shorten, users struggle to stay abreast of the system. This can result in deteriorating mental activity and a loss of efficiency, often leading to errors and sometimes to emotional upsets. As interactive systems become more widespread, Boies' phenomenon will become more prominent, encouraging further need to balance mental activity and computing activity in job design.

Adaptive learning

A second important provision of good job design is the capacity to accommodate users' experience. The need for this is illustrated by the work of Turoff and Hiltz (Reference 26) in connection with their research into computer conferencing. They conclude that the choice of features that users found most useful changes with experience. Users who cited increased effectiveness of computer conferencing over face-to-face communications were those having more conferencing experience. The key conclusion of the research was the need to allow systems to change as users learn.

Curley and Pyburn (Reference 27) also conclude that the ability to absorb change is a key factor in successful job design. People who learn to use computer-based systems continue to learn, and they also devise their own methods of use. Curley and Pyburn refer to this as adaptive learning. They have frequently found that organisations define the use of their systems too narrowly, and so lose the benefits of adaptive learning.

Adaptive learning demands a continuous re-evaluation of needs, and a shift in emphasis away from the common approach of finding fault and attributing blame.

THE EVOLUTIONARY DESIGN PROCESS

We now turn our attention to a new approach to the process of change. It is one that is becoming increasingly relevant and realisable, and that appears to offer a basis for achieving change effectively by building an organisation that is more responsive to a changing environment.

Evolutionary design process: the third stage in system design

The evolutionary design process has been described by Eason (Reference 28) who sees it as a third stage, beyond the conventional design process (the first stage) and participative design (the second stage). Before explaining the evolutionary design process, we

first summarise Eason's view of the two earlier stages.

The major characteristics of the conventional design process are presented in Figure 3.2. The dominant theme in this process is putting together a working technical system. End users are typically not involved until the system is being implemented. Learning from the consequences of the system's implementation is used only to ameliorate the effects that have been suffered, by accommodating them within other organisational systems and by the users adapting to the situation. Through a succession of design decisions a system is gradually developed which achieves something specific. At the same time some of its potential is lost.

One step beyond the conventional design process is the participative approach, which has been described by Mumford. The general characteristics of this approach are presented in Figure 3.3. In contrast to the conventional approach, end users are included in steering and design. The overall aim is to encourage users to participate in the creation of the system throughout the design process. But, although user-involvement is essential, Eason's view is that it can be difficult to manage.

The third stage is Eason's evolutionary design process. Eason believes evolutionary design to be increasingly practical in the light of current and foreseen technological developments. (His design process is described in "Behaviour and Information Technology" and summarised in the remaining pages of this chapter, with permission of the publishers: see reference 28.) The aim is to enable an organisation to:

—Determine future opportunities and/or demands.

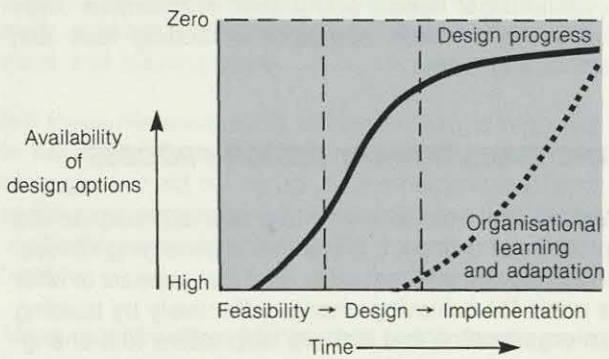
—Establish the most desirable way of organising future tasks and working environment.

—Select the most appropriate forms of technology to support the chosen form of organisation.

Figure 3.4 identifies the main characteristics of an evolutionary design process. The process is based on a technology that regularly transmits information about needs and problems from users to designers, and that helps users learn in an evolutionary way about system facilities and how to exploit them.

The approach recognises that organisational learning about technology and adaption must begin slowly, then progessively evolve. It aims to ensure that the system development path follows a similar pattern, so that organisational learning can direct systems development. An important aspect is that the systems development process is able to accommodate organisational learning. Eason believes that the traditional approach to system design prevents adequate attention to organisational and human factors. User involvement helps, but in practice users have insufficient time to become acquainted with the intended system and its potential effects. The evolutionary model overcomes this problem by enabling organisational learning to feed the ongoing design.

Figure 3.2 Organisational learning in conventional systems design

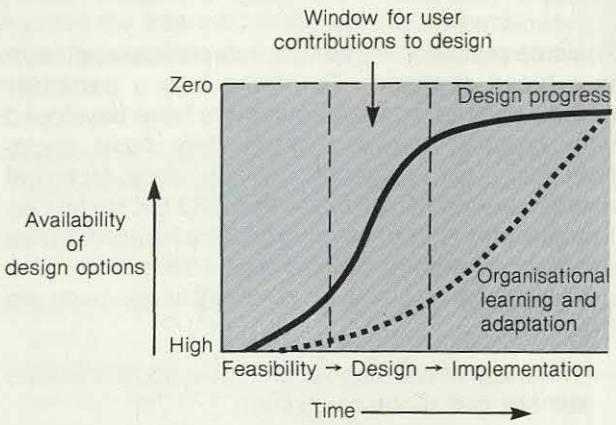


Main characteristics:

- Design process: phased (typically into feasibility, design and implementation).
- Design mechanisms: technical design team with management steering group.
- Organisational learning and adaptation processes: from implementation onwards and not design oriented.

Source: Adapted from Eason (see Reference 28).

Figure 3.3 Organisational learning in the typical participative approach

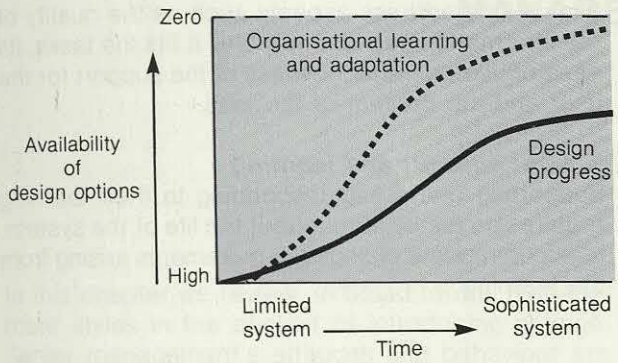


Main characteristics:

- Design process: phased (typically into feasibility, design and implementation).
- Design mechanisms: user participates at design-team and steering-group level.
- Organisational learning and adaptation processes: throughout the design process.

Source: Adapted from Eason (see Reference 28).

Figure 3.4 Organisational learning in evolutionary systems development



Main characteristics:

- Design process: an evolutionary process preserving flexibility for change.
- Design mechanisms: regular feedback from users to design team.
- Organisational learning and adaptation processes: evolutionary and continuous.

Source: Adapted from Eason (see Reference 28).

The strategy that Eason has developed to support and promote evolutionary design contains three mutually dependent strands:

—A technical system undergoing development and evolution.

—System usage which is also growing with time.

—Forms of user involvement which serve the dual functions of enabling users to participate in design activities and to be supported in system usage.

Figure 3.5 illustrates the three strands together with seven major activities that each strand leads to in the system development process. The major activities are described briefly in the paragraphs that follow.

1. User involvement

The mechanisms for involving users depend, amongst other things, on the organisation's culture, industrial relations, and existing user groups. The general rules are to ensure that all those affected are involved in some capacity, that representatives maintain good contact with those whom they represent, and that users are involved in those aspects of design for which they have experience.

2. Pilot systems

Using low-cost and easily implemented small-scale systems (pilot systems) enables users to experiment and learn. The objective is to provide users with an experience which enables them to specify the service they require — it is not designed to test and prove a service for wider implementation.

3. Trials and experiments

Pilot systems provide the vehicle for users to consider many different design issues concerning, for example, job design, work organisation, and man-machine dialogues. Pilot systems also enable users to become familiar with issues of system usage, such as the consequences for job skills, numbers of jobs, and job grades. Through experiment, users can learn to cope with the system without the normal anxieties.

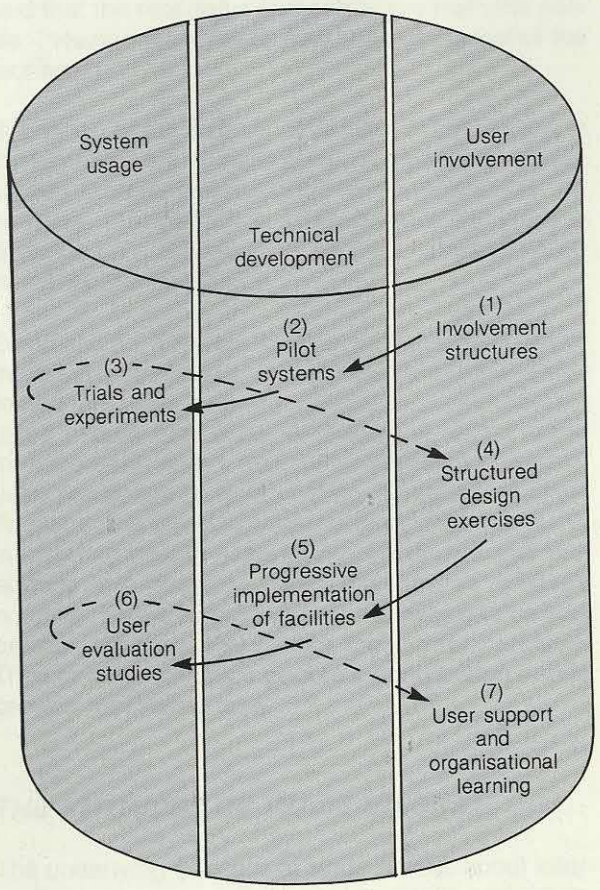
4. Structured design exercises

It is necessary, according to Eason, to structure the process by which the experience gained from pilot systems is used to take decisions. He suggests a four-stage procedure for considering possible work designs, such as the siting of terminals in an office:

—Stage 1: Eliciting alternative solutions. (External advisers may be necessary to identify other options and to encourage users to present their ideas.)

—Stage 2: Generating the criteria to evaluate the options and to rank them.

Figure 3.5 Methods of evolutionary systems development



—Stage 3: Evaluating the options. (The experience of users with the pilot systems and with their working environment can be very useful in judging the viability of alternatives.)

—Stage 4: Elaborating and testing the favoured option.

5. Progressive implementation of facilities
In Eason's model the provision of system facilities is a continuing process, allowing the system to evolve as users learn and as the definition of their needs evolves. The learning comes from the trials and experiments as well as from the evaluation studies and organisational learning that is associated with the operational system.

6. User evaluation studies
This is a relatively formal procedure to ensure learning by people at all levels in an organisation. The evaluations address aspects such as the quality of the information service, how well it fits the tasks, its ease of use, the effectiveness of the support for the user and the content of the jobs.

7. User support and learning
Supporting users and responding to their learning requires an ability, throughout the life of the system, to accommodate changing requirements arising from the learning.

CHAPTER 4

MANAGEMENT AND TRADE UNION ISSUES

In this chapter we review, in broad terms, management styles in the context of introducing change. Senior management's attitudes and behaviour are important in determining whether staff reach their potential, and in improving employees' jobs and motivation.

We also review the attitudes to change of trade unions in Europe, looking particularly at attitudes to information technology, and the general legislative framework. Despite significant national differences, the overall trend amongst trade unions is to pay increasing attention to issues arising from information technology.

MANAGEMENT STYLE

Information technology is now associated with much of the change that is occurring within organisations. There is sometimes a tendency to associate negative consequences of changes, including resistance, with the technology itself or with the methods of the change agents. Although there may be a direct connection between resistance and methods, the underlying problems are likely to be more fundamental. Land et al (Reference 14), in their study of change within the plants of a vehicle-components manufacturer, found the primary factor influencing the acceptability of new systems to be each plant's history of industrial relations. Introducing information technology brought into the open the underlying problems.

These underlying problems appear to relate specifically to the way people are treated by management. Industrial relations problems are often the manifestation of past management malpractice.

Employee and industrial relations appear to be the product of management behaviour and style, which in turn are founded on the apparent attitudes of senior management. In their investigations into excellent American companies, Peters and Waterman found plenty of evidence indicating that the attitudes of the senior executives determine a company's culture and success. Prominent amongst those values is that associated with the utilisation of human potential. Chester Barnard, president of New Jersey Bell, has asserted that the leader's role is to "harness the social forces in the organisation, to shape and guide values". Peters and Waterman found that "the excellent companies are above all, brilliant on the basics. They listen to employees and treat them like adults. The excellent companies require and demand extraordinary performance from the average man." Rene McPherson, former chairman of Dana, urged attention to the "care, feeding and unshackling of the average man".

Whatever one's personal attitudes may be, the message clearly is that some organisations, and particularly those which appear on many counts to be successful, pay very careful attention to the human dimension. P Strassman of Xerox Corporation once said that the real gains can only come from the people: "Human work needs must be put in front of the technology".

Buchanan of the Scottish Business School supports the key influence of management attitudes in the way human factors are regarded by management. He believes that effective management of change depends on a fundamental and irreversible change in management attitude.

Summarising, it is management values, and management behaviour and styles of leadership, that determine the degree to which organisations succeed in using people effectively. Moreover, it is the same management values that determine how constructively people are brought in to the process of change. To overcome the practical problems that may arise in involving people requires a positive management attitude and desire to make the most of people's potential. Those companies that are judged to be successful, even excellent, take the matter seriously. They strive to enhance people's contribution and to provide motivating jobs.

THE ATTITUDES OF TRADE UNIONS

The underlying concern of trade unions about information technology is its impact on health and safety, and its impact on the number and content of jobs.

Involvement with information technology

Concern about the number of jobs has been accentuated by the recession of the early 1980s — the worst to hit the developed countries since before the second world war. Although, as is often claimed, information technology can create employment, the gains hardly match the losses, and the gap is likely to widen in the future.

In their well-known study for the French government in the 1970s, Nora and Minc estimated a 30 per cent loss of jobs in banking and insurance caused by computerisation. They also reported a 25 per cent loss in retail jobs in West Germany arising from the use of electronic point-of-sale equipment. It is now widely accepted that increasing unemployment is inevitable, given stagnant economies and the use of information technology for productivity gains. According to Cooley, at least 30 per cent of the United Kingdom's three million clerical workers will be dispensed with by 1990.

In a recent study by the National Economic Development Office in the United Kingdom (Reference 29), 15 information systems projects were examined. Two had no effect on numbers employed; three inhibited growth in employment; one resulted in a trebling of employment over a four-year period; and nine resulted in significant job losses. In the nine projects that led to job losses, normally between one-third and two- thirds of the jobs disappeared. In one exceptional instance, jobs reduced from 33 to three. Plans for automating the United Kingdom's social security system are reported as likely to lead to a loss of 25,000 staff in the 20-year life of the project.

Trade unions are also concerned about the effect of information technology on the nature of work. One worry is that the mistakes of the past in the field of manual work are beginning to be repeated in the field of office work, resulting in jobs which de-humanise and de-skill.

Wherever trade unions are established, they will seek to increase their involvement in the process of change. Organisations that understand their concerns will work to ensure that union involvement is meaningful and constructive.

THE LEGISLATIVE FRAMEWORK

The role of trade unions in the process of change is influenced by national legislation, which differs between countries. In societies such as the Nordic countries with an established structure for industrial democracy, this involvement is fairly well laid down. Other countries, such as West Germany, have agreements setting out conditions for introducing technology, but the agreements apply mainly at a local level and cover a minority of employed persons. Other nations have few, if any, agreements concerning information technology.

Where there is little in the way of formal agreements relating specifically to information technology, trade unions have sometimes taken the initiative as a by-product of safety-at-work legislation. We believe this to be a trend that will grow. However, we also expect that there will be more regulations concerning information technology at both national and European levels. The European Economic Community is paying more attention to matters arising from the use of technology.

Legislation on broader social and human issues is also pertinent to the discussion. Hopwood (Reference 30) has reported an emerging interest in forms of social accounting, reporting, and auditing. In France, annual social reports are already required in organisations employing more than 750 people. In West Germany, about 20 of the largest firms now publish social reports regularly. In one of its social reports, a Swiss company self-critically confessed that many of its jobs were extremely boring.

Developments in the United States are also relevant. A spokesman from a leading accounting firm has said that the performance of companies is being measured against new and unfamiliar norms. "Corporate critics are attacking the artificial divorce of economics from politics, morality, and the other dimensions of life". The American Accounting Association has issued reports of a committee on 'Non-financial measures of effectiveness' and of a committee on 'Measures of effectiveness for social programs'.

It is becoming more likely that organisations in some western countries will have to meet the requirements of legislation regulating social and human issues. Toffler has said that "A corporation is no longer responsible simply for making a profit or producing goods, but for simultaneously contributing to the solution of extremely complex ecological, moral, political, racial, sexual, and social problems". Some companies have already responded to the trends. Control Data Corporation states its mission as "improving the quality, equality, and potential of people's lives". At Chemical Bank in New York, 10 to 15 per cent of a branch manager's job performance appraisal is based on his or her social performance.

It is worthwhile expanding on the advanced legislative framework in the Nordic countries. Here the environment is characterised by formalised industrial democracy that ensures that all levels of white-collar and blue-collar employees can influence decisions affecting them. Legislation and agreements specifically provide for user involvement in the design of information systems. Trade unions are able to employ

consultants for expert advice at the company's expense, if the company is unable to provide the requisite skills.

The Nordic countries are familiar with socio-technical approaches (see Chapter 3) to the design of information systems. There is a wide conviction that user involvement is essential to successful system design, but achieving constructive involvement has not proved easy in practice. The problems are similar to those we identified in Chapter 3, and which we illustrate in the case histories in Chapter 5. However, there is a general conviction that the need is to overcome the problems, rather than to revert to more traditional and less participative methods.

CHAPTER 5

CASE HISTORIES

In this chapter we present six case histories, each chosen to illustrate practical lessons in handling the human aspects of change arising from information technology.

The case histories are those of the Driver and Vehicle Licensing Centre in the United Kingdom; Rowntree Mackintosh in the United Kingdom; UCPA in France; an anonymous nationwide, branch-based company; Lloyds Register of Shipping in the United Kingdom; and finally the Banque Laydernier in Haute-Savoie, France. To make comparison easier, we use a common format for presenting each case history.

CASE HISTORY 1: THE DRIVER AND VEHICLE LICENSING CENTRE, SWANSEA

Our first case history concerns the United Kingdom Department of Transport's Driver and Vehicle Licensing Centre (DVLC) in Swansea. About 4,000 people work at DVLC. Their task is to issue driver licences and vehicle registration documents and to update associated records. On average, the DVLC issues over one million vehicle registration documents and almost one million driving licences every month.

Objectives and characteristics of the project

The original mainframe computer systems, together with the data entry equipment which underpins the current operations, will reach the end of their useful life by the mid-1980s — hence the replacement system project. Practically all the DVLC's computing equipment will change — mainframe computer systems, data entry systems and most of the despatch equipment. The replacement equipment will include two large mainframe computer systems, laser printers and 1,500 terminals. Optical character recognition equipment will be introduced to handle renewal reminders.

However, DVLC's objectives go beyond replacing the outdated computer systems. The centre sees this as a valuable opportunity to speed up the service and improve its quality. Ultimately, the replacement system will provide immediate and direct access to driver and vehicle records, including applications received but not yet accepted. The replacement computers and input procedures are intended to remove many of the current delays which frustrate staff and public alike.

The replacement system has to be cost-effective. Its approval (by Ministers and the Treasury) depended on DVLC demonstrating that the replacement system would be more cost- effective over the next ten years than continuing the present system. Savings of 500 staff and £5.5m ($8m) are anticipated.

As well as improving the speed, quality and efficiency of service, DVLC is determined to improve the quality of staff jobs. Staff will work in teams, each team member trained to undertake any aspect of the work if necessary. The intention is that the new jobs should be integrated and satisfying: a good deal of flexibility and freedom of choice will be built-in.

The DVLC's aim is to meet these objectives, at the same time maintaining operational continuity during the transition period. It was recognised from the outset that such a project demanded a step-by-step approach — evolution rather than revolution. Planning began in 1977. The contract to supply the replacement computers was awarded in the autumn of 1983. A period of two years, beginning in July 1983, has been set aside for converting from the original to the replacement system. Optical character recognition equipment is being introduced in 1984 and a 12-month trial of the input procedures began in spring 1984. The plan is that all the functions of the replacement system should be available by October 1985, the 1,500 terminals being introduced progressively in batches between 1984 and 1987.

The replacement input procedures entail radical alterations to existing operational areas. For a three-year period many staff will be temporarily relocated.

Four-phase approach

As one manager expressed it: "The fundamental requirement of successful implementation can be best expressed as the need for thorough planning, management and control". There are many factors in this including stability, the need to freeze the origi-

nal system during the two years required for conversion, and contingency planning, such as extending the life of the original computer and data entry equipment after the replacement system is fully implemented.

The two most distinctive features of DVLC's approach to the planning, management and control of the project are that it is evolutionary and involves people in all functions and at all levels. Planning and implementation is taking place in four phases: preliminary study, full study, implementation planning and implementation.

The preliminary study phase (1977 to 1979) was undertaken by a small group of data processing staff, who looked at the alternatives and identified the options. The proposal was endorsed by a higher management steering group. Trade unions were kept informed and invited to comment at the end of the phase.

In the full study phase (1979 to 1981) a new branch, ADP Replacement System (ADPRS), was established to conduct a feasibility study encompassing the design, cost and implementation plans for the replacement system. ADPRS combined data processing specialists with line managers including the supervisory (Executive Officer) level. ADPRS was later complemented by another new branch, Operation Replacement System, responsible for producing detailed user requirements. The branches established a consultative machinery to ensure involvement of all staff, each branch adopting its own measures. Video films, discussion sessions and pamphlets were all used. Trade union users were kept informed. Departmental and local joint working parties were set up to discuss the plans.

In the implementation planning phase (1981 to 1983) video films and discussion sessions continued. Staff continued to be involved in producing the user specifications and in the consultations that were undertaken within branches. A management of change training programme for all managers and supervisors began. Staff were involved in evaluating the available furniture and equipment, and possible office layouts.

In the implementation phase (1983 onwards) the use of video films, discussion sessions, and the "management of change" programme are all continuing, as well as the involvement of staff in the evaluation of furniture, equipment, and office layouts. A newsletter, "New Project News", is reinforcing communications.

The essential point about the DVLC's approach is the effort made to involve users at all stages of the planning and design of the replacement system — not just informally, but through many formal channels (including line management), through the use of films and other forms of communication, and through training, new structures and the trade unions. This illustrates another sense in which the DVLC approach is evolutionary. The mechanisms and structures for involvement may be new, but the philosophy has developed as a result of long-term practical experience.

The original system caused many problems, both in operations and in staff motivation. Since the inception of the system, DVLC management and trade unions have been building a form of management which encourages staff at all levels to take part in a continuous process of identifying and solving problems of operating and job satisfaction. Working parties, consultative groups and other forms of representation have been used as part of what those at DVLC refer to as a job-satisfaction style of management. The style has proved a useful foundation for the replacement system project in three important ways:

- It has enabled staff, management and the trade unions to learn to work together to solve problems, identify features of good job design and resolve differences.
- It has led to an integration of many of the 'assembly- line jobs' created by the original system. The aim is to produce more satisfying jobs that ease problems of motivation, as well as improve service. These integrated jobs are the basis for the team working that is envisaged as the foundation of the replacement input system.
- The clerical and data preparation staff are no longer people with mere assembly-line skills. They have developed skills that enable them to cope with the new work — skills which are interpersonal as well as technical. Indeed local management and many of the staff themselves go as far as to say that they welcome the opportunity that equipment replacement offers to carry integration further.

Both senior DVLC management and the trade unions have become committed, in their different ways, to staff involvement. As one data processing manager expressed it: "The director's commitment set the climate . . . it had to be good communication and staff involvement . . . no other way would have been allowed".

The approach in practice

The ability of DVLC staff to cope with change has been greatly strengthened. And, as people have become more accustomed to being informed and consulted, so their expectations have been raised and their desire for involvement has grown. Nevertheless, in a project of this scope and complexity, practical

problems are inevitable, as we illustrate in the paragraphs that follow.

Project management and control
Relationships between systems designers — both data processing, and organisation and methods (O&M) staff — and users have improved greatly during the replacement system project. This is reflected in the ability of many planners and users to see the problem from the other's point of view, learning to work together in a new way. An ex-user commented: "The users didn't know enough to comment sensibly and ADP didn't know enough to use users' experience effectively". One planner with an O&M background said: "ADP planners have had a frustrating time learning to get used to consulting people and to coping with people changing their minds . . . but this has led to a positive shift in attitudes over the last five years".

The project has also been successful in another respect. By helping to create a high level of understanding of what is being attempted and why, it has helped to minimise potential hostility to the replacement system. But, despite progress, DVLC staff accept that there remains scope to bring planners and users still closer together.

Communication
The most effective forms of communication were direct, personal and designed to meet the needs of those receiving the message. For instance, line managers in one of the fast-keying sections were concerned about the data preparation staff's fear of doing clerical work. They arranged for some of the more anxious members of staff to help on a clerical section and learn the work. Quickly these members of staff found they could cope with clerical work — and, indeed, that they enjoyed it. They were then able to use this experience to calm the fears of their colleagues.

Following the success of this venture, the same line managers invited some of the clerical staff on another section to a special session of sight-and-sound training given to data preparation staff. The clerical staff found that they could use the keyboard without difficulty, and so they lost their fear of using terminals. They, too, used their experience to reassure their colleagues.

Not only did this simple initiative reassure people about their ability to cope with the impending change, it also helped to remove misconceptions and prejudices which existed between data preparation and clerical staff, so helping to lay a sound foundation for team working.

Staff involvement
Many of those we spoke to on the various consultative groups did tend to feel involved — particularly, for instance, in the ergonomic aspects of the project. But they felt they had more to offer than was yet being tapped.

There is most scope for further involvement however among those end users who are not yet part of a consultative group. The extent of their involvement depends on the ability and willingness of their representative to identify and voice the views of others (and, of course, on the ability of line managers). Few representatives, it seems, do an adequate job. One problem is the representatives' inability to answer their colleagues' questions.

Naturally, the trade unions have expressed concern at this lack of grass-roots involvement. They feel that training should be offered to equip the representatives to do their job. And they would be willing to help provide it. They also endorse the view, shared by many user managers, that people should have been involved earlier and more fully.

Lessons learned

We asked everyone we interviewed what advice they would give, as a result of their experience, to those engaged in systems design elsewhere. This is a summary of their replies.

Advice from data processing staff:

— "Chop the system design into stages small enough to give only a short time between asking people what they want and being able to deliver it."

— "Set up a pilot as early as possible to give people something to learn on . . . even if you throw it away later."

— "Secure the freedom and flexibility to build a system without being bound by organisational constraints."

— "Make sure the technical system is flexible enough to allow users the freedom to choose their own working methods . . . this is important because it gives end users who do not feel they have been involved in design some real decisions to take, that they are capable of taking and in which they are interested . . . but don't give them so much freedom that it threatens them . . . you have to be able to answer some questions about their future."

— "Don't let line managers force you into making choices about the organisation which they should take themselves."

— "Train users in O&M so that they can contribute sensibly to design."

— "In a large scale project . . . identify as far as possible which individuals will eventually be doing what jobs so that you can concentrate on communicating directly with them."

—"Provide training to help planners learn how to involve people . . . including the art of asking questions."

Advice from users:

—Help planners and users to learn how to work together. For instance, offer training in consultancy skills to planners, and in technical and O&M skills to users. Training should be offered at the outset.

—Develop a direct partnership between planners and users. Planners should not ask users what they want, based on what they have now. The users will not know how to reply. Instead, planners should "start by asking what is the present system, what is wrong with it, how would you like it to be? . . . then the planners and users all go on together to work out how these problems might be overcome."

—Involve users from the beginning — but on issues to which they can contribute constructively. For example, "Let them write instructions themselves rather than comment on ones you have written . . . it's quicker and more effective".

—Only use representatives when you cannot use direct contact. When you must use representatives, choose them for personality as well as experience. Help them learn to do their job, and monitor them to ensure they are doing it effectively.

—Build good two-way communication. Find out what people need to know and tell them simply and directly. Check that they have heard. Listen to what they have to say. Build trust and an atmosphere in which they will speak their mind.

—Give people information as soon as possible. "Don't be defensive about dissemination . . . if the situation is still fluid, say so, rather than wait till it is all certain and risk people feeling that you are withholding something from them".

—Allow plenty of time. Attitudes are slow to change. The required abilities are slow to develop.

—Monitor the "people factors . . . make someone accountable for ensuring that people are being involved, informed and listened to . . . do not just rely on people being flexible enough to fit in with whatever you design."

—Define objectives and responsibilities clearly and set up structures to ensure they are met.

Advice from the trade unions:

—Identify clearly what people can contribute. For instance, involve the trade unions in ergonomics where they have experience, and involve staff in designing their own jobs.

—Go for a bottom-up rather than top-down design process to tap the reservoir of expertise of those who will be using the system.

—Produce documents in plain language, not technical jargon.

—Complement written communication with direct verbal communication and discussion.

—Find out what people want to know and tell them that, "rather than what you think they want to know . . . go round and talk directly to people . . . build up a down-to-earth human exchange."

—Train representatives to do an effective job.

—Provide training to help people at all levels, not just supervisors, to cope with change.

—Sort out grading and redeployment issues so that people know where they stand.

Advice from the outside consultant:

—Define the scope of the project at the outset and identify who is responsible for doing what, within what resources and by what time.

—Set up structures to ensure these objectives and responsibilities are met, ensuring that the interests of users and planners are balanced.

—Find an efficient means of communicating clearly the objectives and nature of the system to the user.

—"You can't get at user needs just by asking them . . . you need a mutual workshop so that the analyst can help the user learn."

—"Provide training so that the systems analyst can constructively bring to users' attention those aspects of the requirements which users cannot reasonably identify themselves."

—Let people do what they can realistically do; for example, let operational units write operators' instructions and help design operator training.

—Use simulations to help people to gain the experience with which to contribute.

CASE HISTORY 2: ROWNTREE MACKINTOSH

Rowntree Mackintosh is a multinational company manufacturing confectionery, based in York in the United Kingdom. It has a long history of concern for the welfare of its employees. This concern sets the tone of the company's approach to office technology.

This case history describes how the introduction of new technology provided the opportunity for the O&M department (the principal agents of change) to alter the nature of the service the department offers.

Objectives and characteristics of the project

Rowntree Mackintosh wished to use new office technology to make better use of the time and talents of secretaries and managers, to increase job satisfaction and career development opportunities for secretaries, and to provide a better service to customers. On the basis of external and internal research, the company aimed to achieve two main benefits — increasing the creative time available to managers and improving the quality of their decisions; and improving the quality of typing and the speed of document reproduction.

Other benefits sought were a reduction in overheads — for example, by saving floor space, postage costs and overtime; by improving communications and customer service; and by increasing management control and organisational flexibility.

Under the original system one secretary worked for one principal, or for a small group of principals. The O&M department estimated that, as a result, a good deal of secretarial time was wasted. (Secretaries spent about 25 per cent of their time away from the office on errands such as photocopying and filing, which might be more productively organised, and about 18 per cent of their time waiting for work.) Another disadvantage was that, while more senior managers tended to be well-served, those more junior were not.

In an attempt to overcome these problems and following an O&M study of management time, Rowntree Mackintosh decided to establish nine autonomous centres (called administration centres) at their York site. In each centre a small group of secretaries was to provide a range of services, such as typing, word processing, filing and photocopying, to a group of managers. (This did not preclude one-to-one working, for instance, on highly confidential information.) There was also a longer-term objective. The administration centres were to provide a flexible base from which to experiment and develop new systems and pave the way to an integrated group-wide computer filing system.

In addition, the O&M department estimated that about 25 per cent of managers' time was less productive than it might be. This was a very difficult area in which to justify the cost of using new technology. Like many companies, Rowntree Mackintosh decided to experiment using a pilot scheme. Following a study, a pilot system (supplied by Office Technology Limited) was commissioned in January 1983.

Phased approach

As the principal agents of change, the O&M department played a key role in this project. A phased approach was chosen, beginning by establishing the administration centres. In the first, preparatory stage, Rowntree Mackintosh's O&M department began by integrating previously separate functions, such as filing and microfilming, and word processing and text reproduction. Inevitably this had an impact on job design and organisation structures. It gave the opportunity to involve the people affected in redesigning jobs, layouts and structures to meet their needs.

The second phase involved establishing the centres. Throughout both phases, the emphasis was on involving all those who would be affected. Working parties were set up on which users and designers were represented, together with a third party (an "outside agent with knowledge"), who would not be directly affected by the change, but who had experience to contribute and who might help users and designers to work well together.

The training department (which at Rowntree Mackintosh is organised to provide whatever assistance people need, rather than simply to run set courses) helped the people in those working parties to learn to work together. It also helped users to learn to work as representatives, rather than as individuals. The training department also provided special training for administration centre supervisors (leaders) — an important step, because the role of the supervisor requires management as well as technical skills.

The approach in practice

The aim of the O&M department was to provide those in each administration centre, and particularly the supervisor, with plenty of scope to decide how to design their own jobs and organise themselves and their work (in consultation with each other and the managers they served).

Under the new system the supervisors also took on another, wider responsibility: that of meeting with their counterparts from other administration centres at office technology group meetings set up to define and solve problems of change. These group meetings offered the combined advantages of easing implementation, enabling the company to learn about the effects of the new system and apply this learning to future projects, and offering supervisors the chance to develop their skills and to learn and gain support from the experience of others doing similar jobs.

But it was not just the role of the supervisors that changed. The intention was also to offer the secretaries the opportunity to develop their skills and do more interesting work with a wider perspective. They were directly involved in design at every opportunity — in writing the new instruction manuals, for example. It was also possible to offer some additional scope to staff in the typing pool, who were able to help in the administration centres to provide extra cover when needed.

The evaluation of the administration centres has also been conducted in the same spirit. Working parties were set up, including secretaries and supervisors as well as technical staff. The aim was not simply to look at financial aspects, but also to assess what had been achieved and learned in less tangible areas, such as job satisfaction, career development and the quality of service to customers inside and outside the company.

Good communication was another aspect of the Rowntree Mackintosh approach. The company system of monthly briefing groups has offered a valuable base.

The same philosophy of user involvement has determined the approach to the associated office automation project for managers. At first, some of the managers were sceptical about this project. They were unwilling to lose their personal secretaries, they were concerned about learning to use the terminals themselves, and they were dubious about undertaking certain administrative functions themselves. Their full involvement in designing the new system was obviously important. Not only was their knowledge the key to successful design, but their involvement also offered the most effective means of helping them overcome their apprehensions.

The O&M department began the project by interviewing each manager twice. First, O&M staff asked what was needed from the new system. Next, O&M staff questioned the managers about what they felt would best meet their needs, basing their suggestions on their knowledge of what was possible. This led to discussions in which user needs were clarified and plans to meet them were jointly formulated. All the managers were then involved in evaluating equipment, and considering how far it might be adapted, using an evaluation method designed by the managers.

Throughout the project, O&M staff have worked as facilitators, using their expertise to help the people affected by change to design the systems as far as possible for themselves. The role demanded special attention to the way in which the O&M department selects, trains, assesses and develops its own staff. Great importance is now attached within O&M to recruiting only those people who show the potential to work this way, rather than as experts who make all the decisions themselves (the prescriptive approach). The personal development needs of each new member of staff are jointly defined with them and an individual training and development programme is then agreed. The assessment of all O&M staff is an open and jointly agreed process. Assessment is linked with personal counselling, with the aim of providing all staff with the support they need. (This joint assessment/counselling approach began in O&M and is now being adopted by other parts of the company.) The work study department (the equivalent of O&M in the factory) now uses a similar approach.

Lessons learned

When asked about guidelines to offer other management services staff engaged on similar projects, the head of O&M replied: "You can't give other people guidelines . . . it's all a matter of remembering that it's the users who make a system work. You must involve them and help them understand how they can contribute . . . and then do what's right in your company".

CASE HISTORY 3: UCPA

UCPA is a French non-profitmaking organisation devoted to training people in the practice and teaching of sport. Each year the organisation instructs about 100,000 people, who attend around 1,500 different courses at numerous sports centres. UCPA employs about 500 people, many of them on a seasonal basis. There are about 40 permanent administrative staff.

Objectives and characteristics of the project

Beginning in the 1970s, the rapid growth of leisure activity in France brought administrative problems to UCPA from a greatly increased volume of business. Human problems arose as well, as staff became distanced from each other and from their clients. Both the quality of service and job satisfaction suffered as a result. Around 1973 the decision was therefore taken to use new information technology in the administration of registrations. A minicomputer with terminals was envisaged.

UCPA's directors were particularly keen to avoid what they regarded as the "snags which all too often appear with the introduction of computers". The pitfalls they particularly wished to avoid were job deskilling; users being forced to meet the demands of technology, rather than the reverse; and limited computer system effectiveness, stemming from inadequate dialogue between designers and users.

To avoid these problems, UCPA's directors decided to link the technical project with a project to improve working conditions by enriching jobs and improving promotion. They also decided to involve all their permanent administrative staff in the design and implementation of the changes.

Three-step approach

An outside consultant with a particular interest in employee participation was briefed to involve UCPA's staff at all levels and in all decisions.

The consultant proposed a three-step process. First, analysis by user staff of the existing situation and the jobs currently done, with the aim of identifying the best ways of fulfilling the necessary tasks. Second, use of prototypes to enable users clearly to identify potential stumbling blocks and to increase their experience so that they could more effectively contribute to decisions. And third, a new organisation which, because it would be based on the expressed wishes of users, would both be more effective and provide a more satisfying place in which to work.

The three-step process was highly participative. All permanent administrative staff were involved through a series of working parties and discussions which aimed at producing the most acceptable solution possible. The comité d'entreprise (workers' council) did not participate as a formal committee, but individual members took part in working parties and discussion groups.

Throughout the process the consultant's job was that of a facilitator. He was independent and non-directive, working always to ensure real participation by listening, synthesising, focusing debates and offering technical expertise where it was needed. Thus his job was not to offer solutions, but to help people identify and resolve their own problems.

Great emphasis was placed on keeping staff informed about goals and progress towards them.

The end result was a complete reorganisation of work. Individuals doing jobs which were previously fairly limited in scope decided to regroup themselves into autonomous teams. Each team was responsible for a wide range of tasks, using a mix of traditional methods as well as having access to terminals as required. There was scope for inter-team co-operation too.

Each team was free to decide how its work would be distributed amongst members, the roles each individual would play and how these roles might change as abilities and inclinations changed. One team opted for full transferability of individuals between tasks.

The approach in practice

An independent assessment was made of what was learned as a result of following the process. (This assessment, however, was carried out too soon for any objective analysis to be made of how service to the customer had been improved.)

The use of prototypes did much to 'de-mystify' the computer. Such practical experience was valuable in calming fears of the unknown. The experience helped people to use terminals as tools, exactly as management had wished. It enabled users to learn to contribute constructively to decisions about technical aspects of the system.

Users did not find it so easy to contribute to more intangible matters such as work organisation and job design. They lacked the necessary skills, because of their background of doing fragmented jobs within a directed hierarchy. Many of those interviewed in the course of evaluation expressed their frustration at being unable to contribute. Many suggested that specially designed training might have helped. Others suggested that information about what had been done in other similar cases might have given them a tangible basis from which they could learn to comment (a rough equivalent, perhaps, of the practical experience of using terminals).

Despite all the efforts, many users did not feel they had been involved in decisions about work organisation. Their feelings of satisfaction were greater about their involvement in the technical aspects of the project — a reflection of the contribution that they had actually been able to make, and another indication of the need not just to offer opportunities but also to develop users' abilities to contribute.

Those who were used to restricted jobs and authoritarian management were at first suspicious of the opportunity to participate. They suspected that all the decisions had already been taken, and that the project team would steer their views. Another problem for some was the threat to old values of authority posed by opening the door to wider participation in decisions. Middle managers particularly felt under threat. The old values were apparently being called into question. Where would they stand in the as-yet-unknown new order of things?

Despite these problems, the overall assessment of the majority was favourable. Their jobs, which was what concerned them most, became more varied, skilled and interesting as a result of the new system they helped devise.

CASE HISTORY 4: A NATIONWIDE AND BRANCH-BASED SERVICE ORGANISATION

This case history is drawn from a nationwide service company (which has asked for its name not to be revealed) with 25 branches. The company is planning to introduce a data processing business system to improve goods-handling documentation.

Objective and characteristics of the project

The plan was for the system to be used by decision makers, technical and clerical staff. The data processing manager had in mind terminals throughout

the network of branches, connected to a central mainframe computer: a technology-led approach. Terminals were to be allocated to branches on the basis of current workloads and with the aim of minimising costs.

Consultants were asked to comment on the likely effect on people. They identified a fundamental weakness in the strategy. The client was a committed entrepreneur. Business success depended on each branch manager being free to use his local knowledge and initiative to the full. There was a real danger that the strong central coordination envisaged by the data processing manager would severely limit the scope of branch staff to use their initiative. The needs of the branch staff had to be reflected in the systems design. The proposed system was also inflexible in another way. It was based solely on current business requirements and would be unresponsive to fluctuations in the fairly changeable market.

Three-pronged approach

The consultants suggested redefining the system, using a step-by-step approach and involving users in defining business requirements. The suggestion led the company to adopt a three-pronged approach:

—Seminars for senior managers (and for more junior staff later) focusing on the potential of new technology and its implications for the business.

—A pilot system based on a minicomputer with terminals in selected branches, to enable users, designers and managers to learn from experience.

—Central and local steering groups to review progress, to determine what was being learnt and to decide how to apply it.

The approach in practice

The three-pronged approach, designed to help staff from board level to end-user level to learn and apply their experience in determining what was needed, was described by the consultancy as "the project's greatest strength and its greatest weakness". In the event, as so often in such projects, the aim of helping a whole organisation to learn proved difficult to attain.

The seminars with board members illustrated this point. These seminars produced stimulating debate and were greatly valued by the participants. They increased awareness of the potential of new technology and the importance of involving users in design if full benefits were to be achieved. The board also began to work together as a team in developing a strategy for the business which they had not had the opportunity to do in the past. But the consultancy doubted that these insights were fully applied in the project. Senior managers were keen to apply their new knowledge by devising all kinds of new systems. But the data processing manager complained that he was left with the problem of maintaining the original brief in the face of all this undirected enthusiasm.

This experience underlines a common problem of user involvement: how can technical people use the enthusiasm constructively and avoid being overwhelmed or diverted by it? The original intention of extending such seminars to more junior people was never realised. By the time it was possible, the project had developed a life of its own and the participants' enthusiasm lay elsewhere. This illustrates another problem: that of balancing people's expressed interest with their real (that is, company-directed) interests.

It was the pilot system in the branches that received most attention. At first the team of users and designers worked well together. Then problems began to emerge. The success of the pilot system in the first branch encouraged the designers to put terminals into two more branches. But this time the designers overlooked the need of the new users to experience the learning process themselves. The designers were too interested in what they themselves wanted to do, which was to extend terminals to additional local branches. Gaps in understanding opened up between designers and users. This problem was alleviated for a while when the pilot system was enhanced to cover a new aspect of business, so slowing up the designers' rate of learning. But the problem was never fully solved.

Other problems also became apparent. In one instance, managers in one local branch decided to fragment some of the existing jobs, in order to resolve a problem of contention caused by several job holders sharing one terminal. The result was an upsurge of complaints from end users who felt their jobs had been de-skilled. In a second instance, the data processing manager, in attempting to introduce more terminals throughout the branches, produced a common specification purporting to consolidate the requirements of every branch, but which ignored some of the fundamental differences between them.

Lessons learned

One clear lesson from the pilot project was that the original idea of using a central mainframe computer coordinating branch-based terminals would meet neither the business needs of the organisation, nor the personal needs of end users. And the lesson was learned at the cost of investing only in a minicomputer rather than a mainframe.

Based on its experience on this project, the consultancy assisting the company suggested the following general guidelines:

—Achieve user acceptability by involving all those affected by change.

—Proceed slowly, step by step.

—Consider the advantages of pilot systems. They provide the practical experience which people need if they are to learn to contribute constructively. (Designers as well as users can benefit.)

—Establish a framework of steering groups, representing all relevant interests, to identify what is being learned and to consider how best to apply it.

CASE HISTORY 5: LLOYDS REGISTER OF SHIPPING

Lloyds Register of Shipping (LRS) is an independent, international, non-profitmaking society. It is the largest of its kind, employing 3,700 technical engineers, administrative and computer staff in over 100 countries. It classifies around 115 million tonnes of shipping, and is also involved in classifying or certifying offshore drilling rigs and production platforms, ocean engineering, plastic and chemical processing plants, hovercraft, containers, submersible craft, hydroelectric plants and nuclear power stations.

To meet the challenge of growing competition, LRS has invested in new technology to ensure that technical staff are kept fully up-to-date and are able to offer an increasingly sophisticated and comprehensive service.

Objectives and characteristics of the project

An early and crucial step was the Shipping Information Service (SIS), upon which this case history is based. Establishing SIS, altogether an eight-year task, meant creating a database recording the life history of each ship. The database is used to generate the 4,000-page Lloyds Register of Ships; it is also available online to terminal users worldwide.

The responsibility for developing SIS lay with the Shipping Information Service Group (SIS Group), established specially for the purpose. Originally the work was undertaken by two separate departments, operating in parallel but having quite different objectives. This caused dissention and even, on occasions, non-cooperation. A manager was appointed with the aim of welding together the 60 staff and preparing for the new system.

The approach chosen

The complexities of the task — both technical and motivational — contributed to the choice of a two-stage approach to the project. This proved to be important. It enabled planners and users to apply in the second stage what they had learned in the first stage. It also enabled line managers to exploit the achievements of the first stage to motivate staff to cope with the enormous amount of tedious clerical work that was required of them during the second stage.

The manager was committed to gaining user acceptance of the new system by involving all the users, including end users, from the outset. Another advantage of this involvement was that it enabled both line managers and designers to benefit from the experience and ideas of the people who would ultimately do the job. Where representatives had to be used, (as they were, for instance, in the testing of equipment), discussions were held also with the represented staff.

Users were involved in matters to which they could realistically contribute. One such area was the design of new jobs. The project aimed explicitly to create new jobs designed "to allow managers to be flexible and staff to be adaptable. We learned quickly that no matter how well thought out our forward planning, or how carefully planned our strategy, we had to be prepared for adjustments almost on a daily basis."

Jobs had to be flexible and had to offer satisfaction and scope for individuals to develop their skills — important for retaining people, for creating the will to do the job well, and ultimately for providing good customer service. Good communication was vital in securing user acceptance. In practice this meant foreseeing what would cause anxiety, and providing the necessary information, reassurance, and even personal counselling, to help people deal with their concerns. At lower clerical levels the main fear was of redundancy, though the new business has, in fact, created entirely new jobs.

Staff were able to gain experience in areas that were causing them anxiety, so that they could begin to overcome their concerns. For instance, dummy workstations were set up so that staff, managers and users alike could become more familiar with what would be involved in using them.

Another important feature was the effort made to develop a constructive relationship between computer services and user departments. There were a number of practical problems to be solved. The users, who were largely unfamiliar with new technology, were divided into "inexperienced youngsters who took to new technology as a duck to water, and experienced oldsters who did not really want to know about computers".

The computer department offered its own team of analysts and programmers to concentrate on the task of understanding SIS Group needs and how to meet them. Experienced users from SIS Group joined this

team to ensure a balance of design and operational experience. In summary, the main elements of the approach were:

—Central steering and coordination.

—A staged approach.

—User involvement.

—An emphasis on communication.

—The provision of opportunities for users to gain experience in using equipment, through dummy workstations.

—Determined efforts to build constructive relationships between users and designers.

—The provision of adequate training.

The approach in practice

The first stage did not work as well as hoped. The relationship between users and planners had not yet achieved a constructive balance. The technical and systems people still out-influenced users, so useful operational experience was lost. On the other hand, this stage was a valuable experience. It got the process going. It provided an opportunity for users to start to become familiar with the new technology and enthusiastic about how it could help them to improve service to their customers, and to increase their own skills and satisfaction. This enthusiasm for the project helped to carry the users through all the tedious work involved in the second stage.

The second stage was more successful. It reflected the greater involvement of the user department and an improvement in the working relationships between users and technical staff. But, even in this stage, the ideal balance between users' needs and designers' needs was not always achieved. Both managers and users felt that, from time to time, design staff paid insufficient attention to the views and requirements of those who would be operating the new system. Changes had to be made in the original proposals because they were not practicable. The user department believed that more consultation, and a greater willingness to accept users' views, would have eliminated some of these teething troubles.

Lessons learned

Commercially the project was a great success. It enabled Lloyds Register of Shipping to stay ahead of its competitors, to offer a new service, and to gain a significant new source of revenue. The company increased the flexibility of its organisation and thus its ability to respond to future market changes. Amongst the staff the project created an interest, even an enthusiasm, for new technology and what it could offer, and an eagerness to accept further change.

The SIS Group has lost some of its most capable staff because their interest in new technology led them to transfer to the computer department. But this is seen as healthy because it increases job satisfaction and improves career development, which is an advantage to LRS as a whole.

The guidelines offered by Lloyds Register of Shipping on the basis of its experience take the form of advice to line managers responsible for managing change. But the guidelines are relevant also to management services staff:

—"Ensure that you and your junior managers know the staff well."

—"Anticipate staff reactions. Reassure them and help them deal with their concerns. Remember that job security is important — offer it if at all possible."

—"Don't be too busy to help when needed — make sure there is enough time allowed for such activities."

—"Recognise and use the potential of staff."

—"Seek people's advice — remember you do not know all the answers."

—"Involve staff in an organised way — participation is the key."

—"Stay open-minded about who needs to be involved. Keep asking 'Who needs to be involved?'. It may not be those you first assumed it would be."

—"Ensure that representatives are doing a good job."

—"Be honest. If you make a mistake, say so. Communicate the whole objective to people. Set realistic, reasonable and agreed deadlines. Do not be tempted to set early deadlines because you do not trust people to meet one which would be realistic. It's your job to make sure they do."

—"Use the opportunity to involve people in designing more satisfying jobs."

—"Changes in organisation structure may well be needed as well as changes in jobs and systems."

—"Any change process needs a motivator who is available to give advice and encouragement when needed."

—"Remember that improving service to the customer is a powerful impetus to change and, properly used, this desire can produce wide support for the project."

—"Do not be fooled into thinking there is a master plan which will ensure success. It's a philosophy of involvement that is needed, not a set of rules."

CASE HISTORY 6: BANQUE LAYDERNIER

The Banque Laydernier is a French regional bank based in Haute-Savoie. Its annual turnover before tax is around 200 million francs ($25 million). It holds approximately 49,000 accounts, involving about six million entries per year. Its administrative office employs 370 people and its network comprises 32 branches. In 1979 Banque Laydernier began a process of computerisation and work reorganisation designed to improve both its administration and its use of employees' skills. Its motivation was the need to respond to changes of three kinds: in its economic and commercial market, in the needs of its employees, and in society in general.

In common with other banks, Banque Laydernier faced a situation in which its market was saturated. (In France, 87 per cent of adults hold a bank account.) Competition was therefore fierce. At the same time the cost of offering and administering the increasingly large range of services was growing rapidly, and computer costs were an important element. The possibility of introducing minicomputers seemed to open up the opportunity to rethink the whole system and to contain or reduce costs at the same time.

In response to social changes and emerging employee needs for more autonomy, the Banque Laydernier had been attempting for some years to improve working conditions. The change to minicomputers seemed to offer more scope to create jobs which would develop people's ability. One of the bank's directors described a situation in which banking is "no longer administrative . . . it has become commercial. We must convert our employees from clerical to commercial employees. This demands selling, and an entrepreneurial approach from all levels". To achieve this evolution he saw the need "to increase employee participation in management and business problems. The computer can do some of the clerical work, freeing time for more entrepreneurial effort".

Thus Banque Laydernier had three inter-related objectives: to control costs, to improve commercial effectiveness and to develop the skills of employees. To meet these objectives, senior managers saw the need for a particular kind of organisation and a particular kind of change process. To respond to commercial realities, they required above all a flexible organisation. Within this, branch staff needed to be sufficiently autonomous to respond to local needs. To be responsive, they had to be sufficiently free of repetitive clerical work to act in an entrepreneurial way. Thus the technical system had not only to relieve people of tedious and meticulous clerical work, but had also to be flexible enough to allow for local variations.

To help achieve these objectives the bank also saw the need for a process of change, which involved end users and their management and gave them scope to take relevant decisions. Having identified the requirements, the bank selected a consultancy company to translate these requirements into the new system. One of the selection criteria was a commitment and an ability to involve bank staff in relevant decisions.

A framework for the new technical and social system was then established, paying particular attention to the needs of users. Various working parties contributed, each involving users. A pilot project with a prototype system in one branch allowed options to be tested by potential users. The framework deliberately allowed a good deal of flexibility for branches to decide for themselves what form the new system — both technical and social — should take in their individual settings. Individual branches vary greatly in size and setting. Within them, people vary greatly in their age, abilities, experience and training needs. At the insistence of senior management the system permitted a great variation in local procedures because of this diversity. The basic software was written with this in mind, and it provided scope for people to amend the way they worked as they gained practical experience of operating the new system.

Thus there was much real involvement at branch level in deciding the operating details of the technical system and work organisation, and also in identifying local training needs. However, it was not open to branch staff to question or to contribute very directly to the overall framework.

This lack of user involvement in deciding the overall framework is, in the view a representative of l'Agence Nationale pour l'Amelioration des Conditions de Travail (ANACT), unlikely to be a problem. In France it is culturally acceptable for senior management to take such decisions. In any case, management's original specification required so much local autonomy and emphasised so strongly the need for the new system to offer opportunities for employees to develop their skills that people had ample scope to exert an influence.

The Laydernier project has yet to be evaluated because the system is not fully implemented.

CHAPTER 6

GUIDELINES FOR MANAGEMENT

Despite their differences, the six case histories described in Chapter 5 exhibit some common, distinctive themes. In this final chapter we draw on the lessons of the report, and particularly those of the six case histories, to draw up guidelines for managers implementing new information systems.

The way in which an organisation undertakes the process of change will depend on many factors, including:

- —Local regulations. In the Nordic countries, for instance, there are a number of conditions that organisations have to observe.
- —The climate of trade union, industrial and employee relations.
- —The nature of the organisation's business, and its culture, management behaviour and style.
- —The distribution of the organisation's power and responsibilities.

A key determinant of the effectiveness of an organisation's information systems, whatever the environment, is the extent to which people who use the system are involved in design and implementation. There is no blueprint for success. Each situation is unique. However, it is clear from the evidence of the case histories, the literature and our research that successful information systems:

- —Are easily usable, especially by non-expert users.
- —Are acceptable to users and welcomed by them.
- —Reflect users' knowledge of what operating circumstances really require.

These points form the basis of the guidelines that are summarised in Figure 6.1 and expanded in the remainder of this chapter.

Foster a healthy environment for change

Building and encouraging an organisational environment which makes the most of the opportunities of change, and even welcomes it, is a responsibility that is shared by many. Success depends upon an open and constructive relationship between employer and employee, and between users and management on the one hand and management services on the other. Such relationships take time to build, and effort to maintain.

If people have work that they enjoy and that motivates them, they are likely to do their jobs well and take more of an interest in recognising the needs for change and opportunities it presents. The scene is set very much by the values, attitudes and behaviour of senior managers. There is much to be gained by managers openly encouraging subordinates to question constructively the way things are done, and to seek to improve. Success may require a change in the attitudes of both managers and subordinates.

The management services department should foster links with managers in the business, to work together in undertaking business and organisational planning and to ensure that appropriate strategies, plans and coordinating policies are established. Underlying strategies should be established and regularly reviewed for the systems that are required and the supporting facilities that are needed, such as those which allow users to test ideas for future systems.

Figure 6.1 Summary of guidelines for management

- Foster healthy environment for change
- Secure top management support
- Encourage ability to change and learn
- Acquire the necessary skills
- Involve people appropriately and at the right time
- Be open minded as to who should be involved
- Devote time to developing the participative process
- Achieve a balanced pace
- Adopt a facilitating role
- Keep people informed
- Think widely about opportunities for change
- Monitor progress
- Coordinate progress
- Involve trade unions
- Plan for incremental change
- Obtain and develop the appropriate tools and facilities
- Provide appropriate support functions

Secure top management support
The key to successful change rests on obtaining top management support. This is, of course, a dictum that has been repeated frequently over the years. The reason for its significance, and its practical implications, are set out in Foundation Report No. 31, "A Director's Guide to Information Technology" (in Chapter 4 of the study). Demonstrable top-level support is needed if an open, evolutionary and participative approach is to yield full benefits. If support is not there at the beginning, then efforts must continue to obtain it.

Encourage ability to change and learn
Establish a training programme for users, user management and the management services department. For senior management such training might provide an appreciation of the contributions that information technology can make, and provide a platform for serious deliberation of long-term opportunities and aims. Training for managing change could also be provided.

Users who are employed in areas that are prospects for the introduction of new information systems could benefit from training in information technology, job design and work organisation. Users and technical staff should also be helped to work effectively with each other.

Management services staff having the desire and the ability to work as facilitators may benefit from being trained to work in that way. It may also be necessary to provide training for management services staff to obtain a deeper understanding of the organisation's business and markets.

Organisations may benefit greatly from investing in experimental schemes involving new applications of information technology. People are best able to learn from these undertakings. Long-term developments can be obtained by providing simulators, models and prototypes, and allowing users to evaluate possible solutions before final requirements are defined.

Acquire the necessary skills
Management services departments may need to acquire additional skills to ensure that the quality of the systems and the jobs that are designed is beneficial in the long term. Ergonomic skills, for instance, may be required to support the design of workstations and man-machine interfaces.

The ability to evaluate opportunities may also need to be acquired. This requires knowledge of the organisation's business and its environment, as well as understanding of the nature of jobs created by new systems.

Involve people appropriately and at the right time
There is much to be gained if those affected by new systems are involved throughout the process of change — starting before any decisions are taken, and continuing through evaluation. However, it is neither realistic nor necessary to try to involve everyone in everything. Rather, it is important to involve people wherever they can usefully contribute. One example is that of end users writing the instruction manuals they will later refer to.

Be open-minded as to who should be involved
A wide rather than a narrow view needs to be taken of who might usefully be involved. Those responsible for the project need to keep re-asking the question as to who should be involved.

Devote time to developing the participative process
In practice, a participative process takes time to develop. Problems are often encountered. Some users are unable at first to contribute constructively (perhaps because they do not know what they need; perhaps because they cannot articulate it). Again, some users prefer to leave decisions to others. This may create a problem because such users may not in the end accept a system someone else has designed, because their own knowledge is not incorporated in it. Yet again, some managers and staff representatives speak only for themselves.

Difficulties of this sort should not be side-stepped. The benefits of user involvement accrue only if the problems are addressed constructively. The costs of moving ahead without gaining the benefit of the commitment and experience of users may be higher than at first appears.

Achieve a balanced pace
Managers should strike a balance between going too far too fast, and going so slowly that important decisions are not taken when they should be (so dissipating people's enthusiasm for the project and the benefits to the organisation). The following guidelines should help:

— Divide the project into manageable segments and proceed step by step.
— Prepare pilot studies to offer people practical learning experience in advance of expensive, possibly irreversible, decisions.
— Avoid permitting the technology (or anything else) to constrain freedom of choice. Keep the system as flexible as possible so that it can go on changing as users become more skilled in recognising and articulating their needs, and as their needs develop.
— Aim for a similar freedom of choice in job design. Allow people freedom to design their own jobs and the scope to change job structures as their needs develop.

— Help to accelerate the rate at which people learn to contribute, to work together and to cope with change. This can be achieved through specially designed training, through the personal support of a 'local expert' (a member of the user's staff), and through the help of experienced consultants.

— Identify people's concerns and look for ways of reassurance. For instance, if they are concerned about using new technology, arrange visits to similar installations, hold demonstrations or use simulators to help them overcome their fears.

Adopt a facilitating role
People should be helped to do things for themselves, rather than having things done for them. It is the users themselves who should decide how to organise and undertake their work.

Keep people informed
People should be informed fully, clearly and accurately about objectives and progress. They should be consulted over what they want to know, and should then be told in clear terms. A variety of complementary methods may be necessary, both written (newsletters, memos), visual (videos) and verbal (through line management, trade union representatives). People should be informed even when the situation is fluid. They are likely to cope better with this than with the rumours which otherwise fill the vacuum.

Think widely about opportunities for change
Willingness to change whatever is necessary is fundamental to helping the system deliver its full potential. Thinking widely about the possible opportunities should be encouraged. For instance, introducing the system may provide an opportunity to improve job design, organisation structures, management style, personnel policies, relations with the trade unions and/or relations with the customer. In formulating these wider changes, ways need to be found for involving anyone affected by them, or able to contribute to them.

Monitor progress
Progress needs to be explicitly monitored on both the human and the technical side. Improvements need to be worked out with users, if all is not being done to ensure that people are involved constructively. It may help to appoint someone to be explicitly responsible for monitoring the human factor, even setting a budget for it, to ensure that what initially may seem a nebulous task is actually performed.

Coordinate progress
Progress should be carefully coordinated and managed — for instance, through steering groups at various levels. Steering groups should represent all relevant interests, including, where appropriate, the trade unions. Members of steering groups should share a clear definition of the project's objectives in the widest sense. Their task should be not only to review progress, but also to coordinate the more difficult task of defining what is being learned from the project and ensuring that this learning is applied.

Involve trade unions
Trade unions, where present, should be involved. The risk of leaving them out is to incur their resistance and to lose the potential benefit of their contribution.

Plan for incremental changes
No matter how conducive the organisational environment, change should be planned on an incremental basis. Facilities and benefits are then available progressively, and the learning experiences of earlier phases can be absorbed and applied.

Obtain and develop the appropriate tools and facilities
The technical design of information systems should accommodate the differing working methods of users as well as their changing needs. To achieve this means acquiring or developing the tools and skills that enable information systems first to be developed quickly, and then to be adapted in an evolutionary way.

Provide appropriate support functions
Management services departments may need to extend the range of support services they provide — to include, for instance, training, educational services and support for users who are undertaking their own systems development.

Organisations should also consider establishing 'temporary-design' bodies, with the specific task of constructing simulators, models and prototypes to help users learn.

CONCLUSION

The aim of this Foundation report has been to acquaint senior management with the factors that determine effective and successful change brought about by information technology. In particular, it has addressed human factors that prevail in every organisation, and their relevance to change. We have established how attention to such factors is important to the long-term health and success of organisations, particularly as social and economic influences become more important in affecting human behaviour.

Organisations, we suggest, are only just beginning to understand the scope of the opportunities that arise from the deployment of information technology. To undertake the resulting change constructively and effectively, and in a manner that enhances organisational effectiveness, requires good management and the use of many skills.

We have identified the factors that are important, comparing conventional methods of bringing about change with more recent approaches.

Finally, we have provided broad guidelines aimed at helping all those engaged in undertaking change arising from information technology.

Turning to the future, it seems clear that the trend is towards involving users more in system design and implementation. Some management services departments are already broadening their range of skills for aiding the change process, for instance in designing jobs and in work organisation. This trend will continue. In some organisations the role of existing technical staff will broaden to encompass these skills; in other organisations such skills will be vested in new roles and initially will be provided by external agencies. Some will seek new packaged methodologies based on socio-technical concepts, though early experiences indicate that there are practical problems to be overcome. Some will adopt the concepts and try to accommodate them within their current approaches. Overall we are likely to see many variations, all leading to the conclusion that each organisation will need to evolve its own methodologies based on its current level of awareness and learning, its culture and its environment.

We believe that the general familiarity of end users with information technology is bound to continue to grow, as the technology pervades new areas of business. Compared with the past, the impact of information technology on jobs will become harder to predict, and human factors will become more important.

There will be a growth in general awareness amongst both managers and users of the potential that information technology provides for changing work and the way businesses are organised. As a result, organisations will be better placed to exploit the benefits of information technology.

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